AVIATION WEEK

50 CENTS

Inertial Guidance at Honeywell

Automation in Navigation

AFTER many years of virtual monopoly as the number one device of long distance navigation, the sextant (and that includes the latest electronic models) may well have to make room for a promising rival.

The name of the newcomer is Inertial Guidance.

An Inertial Guidance System could be defined as a central information source that tells you where you're going by remembering where you've been. Ideal for missile guidance, it should prove invaluable in manned aircraft as well.

Development of such a system is now well along at Honeywell. Besides being self-contained, the Honeywell Inertial Guidance System will be extremely light in weight and attain a hither-to unapproached accuracy.

A good part of the reason why the Honeywell Inertial Guidance System promises such an advance can be attributed to the fact that Honeywell manufactures a line of HIG floated gyros. They are the world's most accurate air-borne gyros. And such gyros are basic building blocks for an Inertial Guidance System.

MINNEAPOLIS **Honeywell**

Aeronautical Division

2600 Ridgway Road, Minneapolis 13, Minn.

E B POWER GS
UNIVERSITY MICROFILM IN
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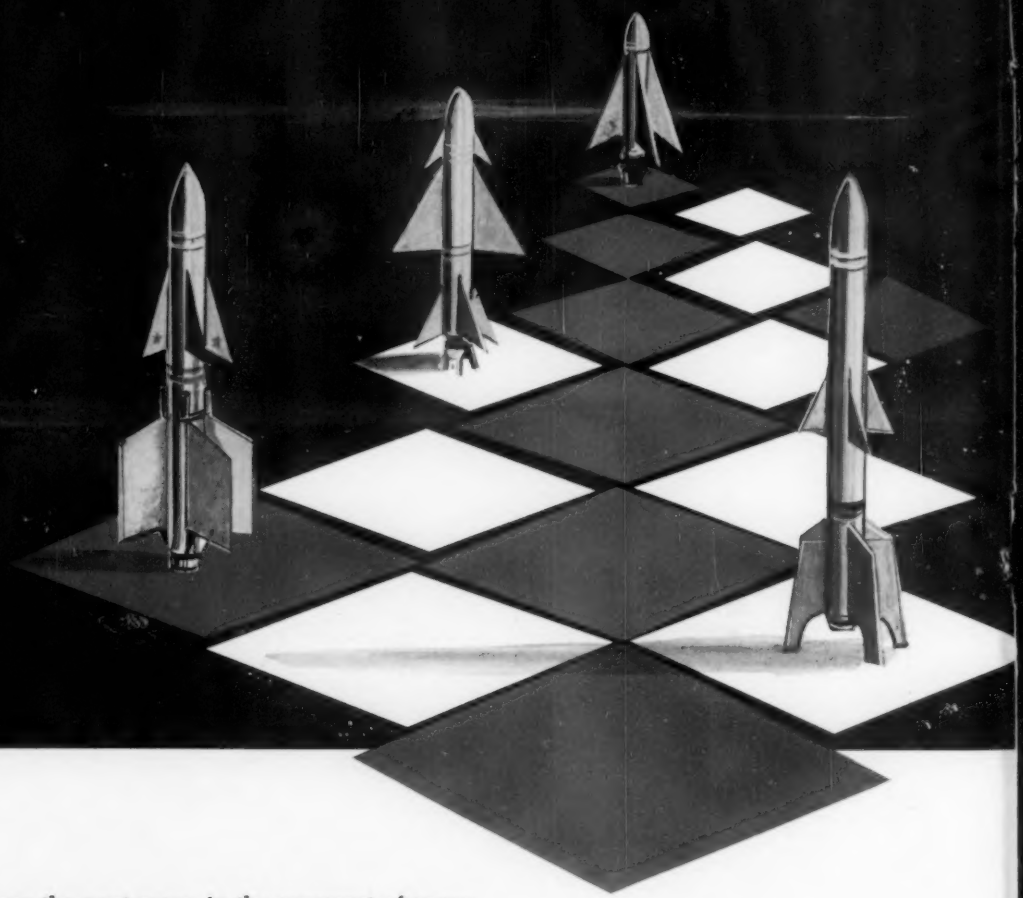
whatever the next move...



Whatever the next move in the conquest of space, Kaylock's forward thinking will design self-locking nuts to meet the high standards required by the aircraft industry.

As the strongest, smallest, lightest, and lowest (height) of all self-locking nuts — Kaylock is versatile enough to meet all of your structural fastener requirements.

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TRADE MARK
all-metal self-locking nuts

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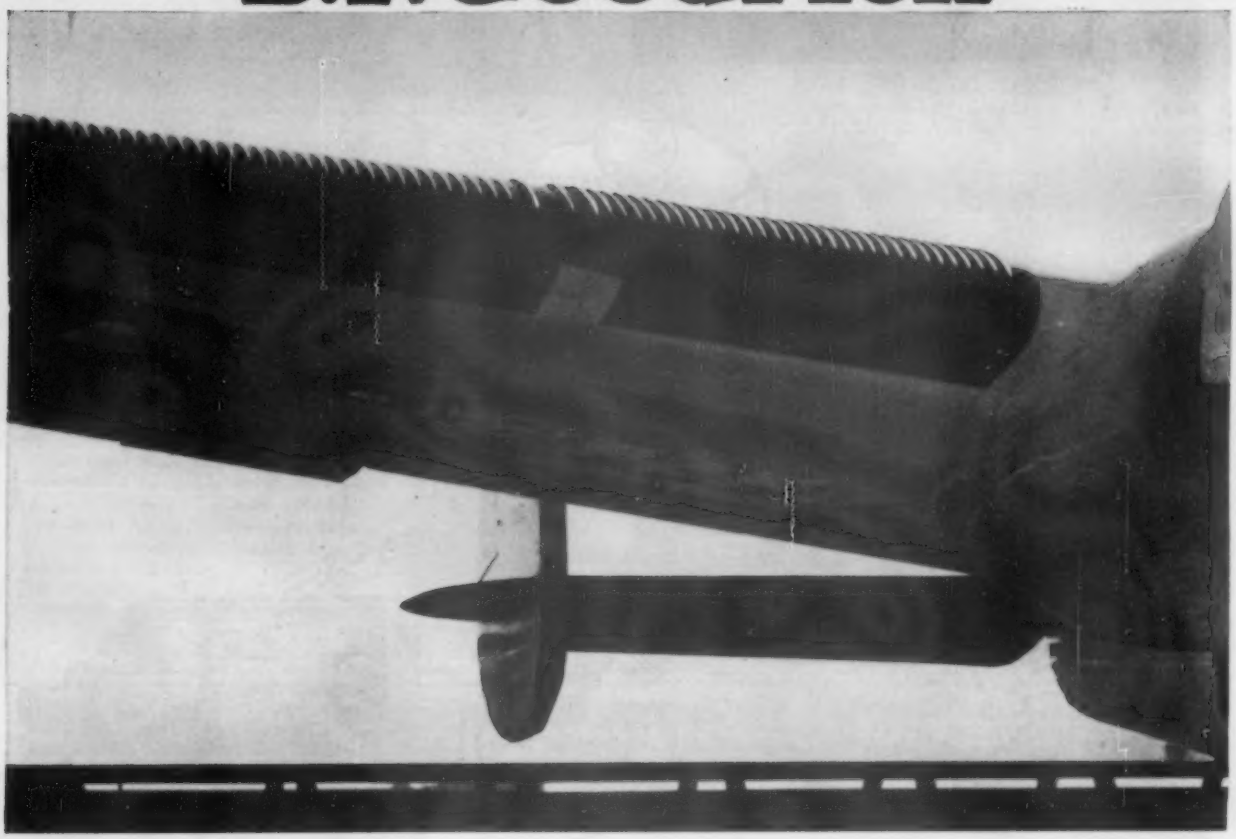
RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



New De-Icers improve air flow on TWA's and Northwest's Super Connies

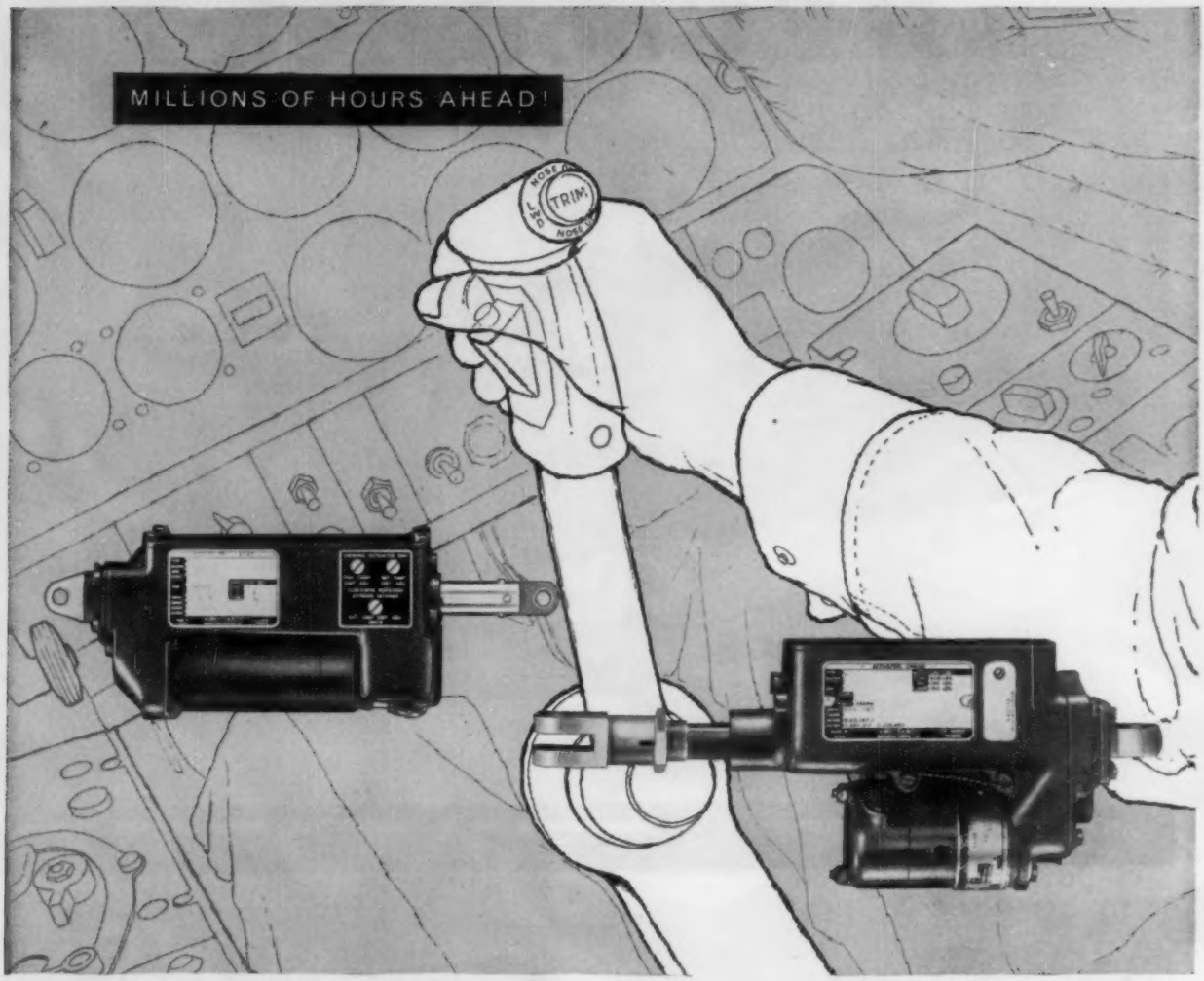
TWA'S AND NORTHWEST'S luxurious new Lockheed 1049-G's can successfully fight ice regardless of air speed and rate of accumulation. They're equipped with B. F. Goodrich pneumatic De-Icers.

Top photograph shows an important part of this De-Icing system—new B. F. Goodrich *chordwise* wing De-Icers (inflated). The small rubber tubes that inflate to snap off ice are built *in line* with the air stream. This improved tube arrangement smooths the flow of air over the wings at all times—even during the brief inflation cycle. Pilots report new *chordwise* De-Icers give the plane a "better feel"; do not alter its flight characteristics.

Extensive wind tunnel and flight tests prove that the ice removing efficiency of the new *chordwise* design equals performance of the B. F. Goodrich spanwise De-Icers that are used on the 1049-G's empennage and wing tip areas.

This B. F. Goodrich De-Icing system, with new *chordwise* De-Icers, was engineered specifically for the Super Connie. It's a typical example of how B. F. Goodrich can design ice protection to solve any icing problem. For other special applications, B. F. Goodrich has also paralleled De-Icer progress with developments in chemical and electrical ice protection.

Other B. F. Goodrich products include: Tires, wheels, brakes; Rivnuts; Pressure Sealing Zippers; canopy seals; fuel cells; Plastilock adhesives; hose and accessories. *The B. F. Goodrich Company, Aeronautical Sales, Akron, Ohio.*



Now...stick-feel for jets at half 1 lb. 2 lb. the weight!

Aerodynamic pressures generated by the tremendous speed of jet planes made it necessary to power their control surfaces. This left the pilot of the airplane without any "feel" control through his stick.

Actuators were needed to supply this stick "feel"... and they had to be of minimum weight and size.

To meet these requirements AiResearch designed highly-efficient units as light as two pounds. Now an even smaller stick "feel" linear actuator has been developed by AiResearch. It handles operating loads up to 150 pounds... static loads to 500 pounds *— and it weighs only one pound!*

It is the smallest, lightest unit in this field! Again AiResearch shows its ability to top previous performances with a smaller, lighter power package.

In the past decade AiResearch has developed and produced more than 350,000 actuators for every possible aircraft application. Why don't you put the proved ability of this high-quality engineering and manufacturing team to work on your problems? Your inquiries are invited and will receive immediate attention.

Qualified scientists, engineers and craftsmen are needed now. Write for information.

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AiResearch Manufacturing Divisions

Los Angeles 45, California • Phoenix, Arizona

Designers and manufacturers of aircraft components: REFRIGERATION SYSTEMS • PNEUMATIC VALVES AND CONTROLS • TEMPERATURE CONTROLS CABIN AIR COMPRESSORS • TURBINE MOTORS • GAS TURBINE ENGINES • CABIN PRESSURE CONTROLS • HEAT TRANSFER EQUIPMENT • ELECTRO-MECHANICAL EQUIPMENT • ELECTRONIC COMPUTERS AND CONTROLS

AUGUST 22, 1955

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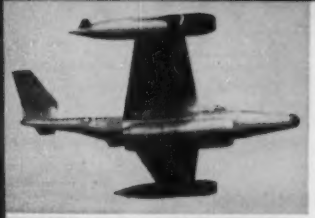
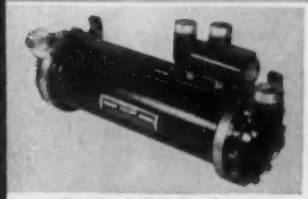
Northrop's Scorpion is the Air Force's most heavily armed all weather interceptor. A rugged fighter, it is powered by two Allison J-35 jet engines with afterburners that put it in the 600 mph class and altitude capabilities of 45,000 feet.



Northrop Scorpion's Cockpit Temperature Controlled By New Lightweight Unit

New Clifford amplifier features unitized construction, ruggedized, miniaturized components, novel pulse element



Clifford Oil Cooler used on Allison J-35 engines.

Amplifier is small, compact, employs ruggedized tubes. Components are potted in resin.

Pulse unit is smallest of its kind and of novel design. Paper clip shows comparative size.

Weighing only 28¾ oz. and measuring 4" x 3⅛" x 3", Clifford's control box marks a number of advances in the field of aviation temperature control.

In addition to its small size and light weight, the control box design embodies several important advantages in service.

Unitized construction makes it comparatively simple to locate a malfunction in service, quickly replace the unit containing the defective component, and get the plane back into the air.

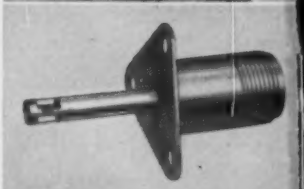
Miniaturized, ruggedized components result in the smallest, lightest control possible for the job to be done. Elements within the box comprise an amplifier, which is highly compact and potted in resin, a novel pulse element smaller and lighter than comparable units, slave relays to operate valve actuators, a power supply, a calibration unit for the electrical bridge and a radio noise filter.

Physical and electrical designs are both concerned with the performance-in-service factor. Electrical input values are held to optimum levels to insure long, trouble-free service. Physical arrangement of parts promotes maximum heat dissipation.

Complete system of Clifford design and manufacture encompasses temperature sensing elements, temperature selector, and control box.

Information or consultation involving temperature control systems custom built to the requirements of specific aircraft on which you may be working is available without obligation.

Write: Clifford Manufacturing Company, 139 Grove Street, Waltham 54, Mass. *Division of Standard-Thomson Corporation.* 7.4.18



Sensing element consists of thermistor beads cushioned in a protective metal tube. They are sensitive, accurate, small, long-lasting and protected against environmental conditions.

HYDRON METAL BELLOWS — CLIFFORD MANUFACTURING CO. WALTHAM, MASS. — HEAT EXCHANGERS

NEWS DIGEST

Domestic

XF-109 vertical-takeoff fighter moved last week from Ryan Aeronautical Co.'s San Diego plant to Edwards AFB for flight tests, confirming an AVIATION WEEK prediction (Aug. 8, p. 9). Although hidden under a canvas blanket as it was carried by truck convoy to the trial area, the VTOL's shoulder-high delta wing, stubby fuselage and triangular fin were clearly outlined. Small fin-like surfaces were located near the wingtips. The XF-109 is USAF's first vertical-takeoff aircraft and the only VTOL so far to be powered by a turbojet engine—a Rolls-Royce Avon with afterburner.

William P. Lear, board chairman of Lear, Inc., will visit Geneva next month to explore the possibility of getting a European airframe manufacturer to design an executive jet transport to his specifications. Another objective is to seek out European designs of equipment that could be fitted into his company's line of avionic and accessory products.

First simulator for training guided missile crews has been developed by Link Aviation, Inc., for the Air Force and delivered to Patrick AFB, Fla. The new device simulates radar signals of a Martin Matador and will be used to train men to control and guide the ground-to-ground tactical missile.

Bell Aircraft Corp. has retained Nuclear Science & Engineering Corp. to evaluate the airframe builder's potential applications in the atomic energy field.

Nuclear aircraft development at Convair-Fort Worth will be directed by a new department. Acting manager of the new unit: Dr. R. N. Little, chief nuclear physicist at Fort Worth.

Prototype Boeing 707 jet tanker-transport has logged more than 200 hours in approximately 135 flights. Four of these have been high-speed runs with the new streamlined refueling boom installed.

Production workers at Westinghouse Electric Corp.'s jet engine plant in Kansas City, Mo., ratified a new contract Aug. 14 to end a two-month strike. The agreement, negotiated by United Automobile Workers (CIO) and management officials, calls for a wage increase of 23 cents an hour.

Twelve Republic F-84Fs flew nonstop Aug. 17 from Sturgate AFB near London to Austin, Tex., in 10 hr. 48 min. The USAF fighter-bombers were refueled during the 4,118-mile flight by KC-97 tankers.

FJ-3 Starts Qualification Cruise

North American FJ-3 is catapulted from the USS Bennington during the Navy fighter's first carrier qualification cruise. In the foreground are spare launching bridles for the FJ-3. In the background, members of the starboard catapult crew are standing by for another Fury to come up on the holdback unit for launching. FJ-3 is powered by 7,200-lb.-thrust Wright J65 jet engine without afterburner.

Antarctic airlift will be carried out by the 18th Air Force this fall to support the Navy's Operation Deep Freeze, a scientific expedition formed for U. S. participation in the International Geophysical Year. The 18th recently completed Operation Gyroscope to Japan, largest and longest troop airlift in history (AW July 18, p. 13).

Financial

Bendix Aviation Corp. reported a net profit of $19,778,666 for the nine months ended June 30, compared with $17,901,493 for the corresponding period last year. Net sales dropped to $439,175,282 from $468,621,982.

Curtiss-Wright Corp. earned a consolidated net profit of $15,065,859 for the first six months of this year, nearly doubling the $7,569,443 reported for the same period of 1954. Consolidated net sales amounted to $250,072,134, compared with $234,550,689. Backlog of unfilled orders at midyear totaled approximately $818 million.

General Dynamics Corp.'s net income for the first half of 1955 dropped to $9,384,757 from $9,840,825 in mid-1954. Net sales totaled $342,989,927, compared with $323,305,659 for the first six months last year.

Northrop Aircraft, Inc., declared a 40-cent quarterly dividend on capital stock, payable Sept. 10 to shareholders of record Aug. 26.

International

Prototype Vickers Viscount 700 took off from Britain last week for three months of tropical tests in South Africa. Purpose of the trials is to test the Viscount's four Rolls-Royce Dart RDa. 6 type 510 turboprop engines in high temperature conditions.

Two Japanese airframe builders, Shin Mitsubishi Heavy Industries and Kawasaki Aircraft, received provisional orders for production of jet fighters and trainers. The orders, placed under the recent U. S.-Japanese production agreement, call for Shin Mitsubishi to assemble 70 F-86 Sabres and Kawasaki 97 T-33s. The two companies will start negotiating firm contracts with Defense Board authorities immediately.

SAVE 10 LBS.,

specify hi-shears

In weight comparison between HI-SHEARS and high strength close tolerance bolts, per thousand pieces and using a ¼" diameter—⅜ grip length—4650 lbs. shear, the bolt-nut-washer weight is almost double that of HI-SHEARS.

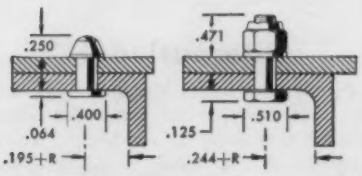
HS52P-8-6	Steel Hi-Shear Pin.....	9.25
HS15-8	Alum. Hi-Shear Collar....	1.32

10.57 lbs.

NAS464P4A7	Steel Bolt	17.35
AN365D428	Alum. Nut	3.40
AN960PD416L	Alum. Washer	.90

21.65 lbs.

Even substituting a 40% lighter titanium bolt for the steel bolt, the bolt-nut-washer combination is still heavier than the HI-SHEAR by 4.14 lbs. per thousand pieces.



Substantial weight savings are also gained by the use of smaller fittings through reduced clearances required by HI-SHEARS.

Write for additional HI-SHEAR data

U.S. and foreign patents — Trademark registered.

hi-shear RIVET TOOL COMPANY

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AVIATION CALENDAR

Sept. 3-5—Twenty-ninth National Aircraft Show, Philadelphia International Airport.

Sept. 6-11—Society of British Aircraft Constructors, Aircraft Show and Flying Display, Farnborough, England.

Sept. 6-17—National Machine Tool Builders' Assn., Production Engineering Show and Machine Tool Show, Navy Pier and International Amphitheatre, Chicago.

Sept. 7-10—American Society of Photogrammetry, semi-annual Convention and Trade Show, Statler Hotel, Los Angeles.

Sept. 8—Airwork-Pratt & Whitney Aircraft Forum, Millville, N. J. Second forum will be held Sept. 16 in Miami.

Sept. 12-15—American Meteorological Society's 139th National Meeting and Fifth Weather Radar Conference of the U. S. Army Signal Corps, Fort Monmouth, N. J.

Sept. 12-16—Instrument Society of America, Instrument-Automation Conference and Exhibit, Shrine Exposition Hall and Auditorium, Los Angeles.

Sept. 17—Institute of Radio Engineers, Symposium on Automation, Cedar Rapids, Iowa.

Sept. 17-18—Antique Airplane Assn., Convention and Fly-In, Ottumwa, Iowa.

Sept. 19-21—American Rocket Society, Western Fall Meeting, Los Angeles.

Sept. 21—Southwest Airmotive Engine Forum, sponsored by Pratt & Whitney and Bendix, Melrose Hotel, Dallas.

Sept. 21-22—American Helicopter Society, second West Coast Forum, Hollywood-Roosevelt Hotel, Hollywood, Calif.

Sept. 28-29—American Institute of Electrical Engineers and Institute of Radio Engineers, Park Sheraton Hotel, Detroit.

Sept. 29-30—Radio Technical Commission for Aeronautics, fall assembly, Hotel Statler, Washington, D. C.

Oct. 3-5—Eleventh National Electronics Conference, Hotel Sherman, Chicago.

Oct. 4-6—Eleventh annual Aircraft Spark Plug and Ignition Conference, sponsored by Champion Spark Plug Co., Secor Hotel, Toledo, Ohio.

Oct. 5-7—National Business Aircraft Assn., eighth annual Meeting and Forum, Sheraton-Cadillac Hotel, Detroit.

Oct. 5-7—1955 National Airports Conference, sponsored by American Association of Airport Executives and University of Oklahoma, Norman, Okla.

Oct. 5-9—World Plastics Fair and Exposition, National Guard Armory, Los Angeles.

Oct. 11-15—Society of Automotive Engineers, Golden Anniversary Aeronautic Meeting, Aircraft Production Forum and Aircraft Engineering Display, Hotel Statler, Los Angeles.

Oct. 17-21—National Safety Council, 43rd National Congress and Exposition, La Salle and Conrad Hilton hotels, Chicago.

Oct. 17-21—International Air Transport Assn., 11th annual general meeting, Waldorf-Astoria Hotel, New York.

Oct. 20-21—Sixth annual National Noise Abatement Symposium, Armour Research Foundation of the Illinois Institute of Technology, Chicago.

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WHO'S WHERE

In the Front Office

Stanley C. Kennedy, chairman of the board, Hawaiian Airlines. Other appointments: **Arthur D. Lewis,** president and chief executive officer; **Jack C. Tobin,** vice president-sales.

Edward M. Powers, recently retired as vice president and a director of Curtiss-Wright Corporation.

Raymond T. Ruder, treasurer of Vitro Corporation of America. Also promoted: **Junius H. Cooper,** controller. Cooper formerly was associated with Hamilton Standards Division of United Aircraft Corp., Chicago & Southern Air Lines and Delta-C&S Air Lines.

Robert L. Firth, vice president-marketing of Electrol Inc.

Russell B. McNeill, administrative assistant to the president of Houdaille-Hershey Corp. McNeill formerly was a Hughes Aircraft Company executive.

Carl J. Arksey, vice president-sales of Abrams Instrument Corp.

Honors and Elections

George R. Mellinger, chief of engineering flight test facilities at North American Aviation, elected chairman of the Institute of the Aeronautical Sciences' Los Angeles Section.

J. O. Yeasting, vice president-controller of Boeing Airplane Co., elected president of the Seattle Control of the Controllers Institute of America. Other new officers: **Tom Gabbert,** plant controller of Douglas Aircraft Co., vice president; **John J. Gilmour,** assistant comptroller of Canadian Pacific Airlines, vice president; **John E. Gallagher,** treasurer of Cornell Aeronautical Laboratory, Inc., treasurer; **James F. Tooley,** comptroller, of Canadair Ltd., treasurer; **Todd G. Cole,** vice president-finance of Delta-C&S Air Lines, secretary-treasurer of the Atlanta Control.

Changes

Cyril C. Thompson, airport consultant to the Aircraft Owners and Pilots Association. Thompson formerly was vice president of United Air Lines, executive secretary of the Airport Operators Council and special consultant to Fred B. Lee, Civil Aeronautics Administrator.

J. Roy Ewans, chief designer of A. V. Roe, Manchester, England. He succeeds **S. D. Davies,** who resigned.

P. M. Prophett, chief of engineering flight test for Convair-San Diego.

Robert C. Andersen, manager of the methods, standards and administration department, Ford Aircraft Engine Division.

Edward J. Duggan, assistant to the general manager of Aircraft Standards, Inc.

Gordon Duguid, general sales manager of Field Aviation Co., Ltd., Oshawa, Canada.

Walter B. Voisard, chief engineer of McCauley Industrial Corp.; **Hugh V. Schierling,** distributor sales manager.

Joseph E. Lowes, Jr., director of public relations for Niles-Bement-Pond Co.

INDUSTRY OBSERVER

► Boeing's KC-135 jet tanker and its 707 commercial transport will each be 1 ft. larger in diameter than the 707 prototype and 40 in. longer aft of the wing.

► **First stage stator blade on Pratt & Whitney J75 turbojet is approximately 10½ in. high, indicating large air-handling capacity of engine. Low-pressure compressor has 9 stages—high pressure compressor has seven stages.**

► F-94 fitted with long-sharp-pointed, missile-shaped nose has been observed in flight. Nose section probably houses missile electronic gear for guidance testing, thus avoiding expenditure of the electronic equipment as in normal missile trials.

► **Hawker will show two new versions of the Hunter fighter at Farnborough this year. One will feature side-by-side seating. This aircraft was originally designated as a trainer, but the manufacturer is now plugging it as an all-weather fighter. The Mark 6 Hunter, equipped with a RA-29 Rolls-Royce Avon jet engine, also will be shown. Thrust of this engine is now 12,000 lb., approximately double the thrust rating of the earliest Avon. The standard Mark 4 Hunter will be displayed at the Farnborough show with a full tactical load.**

► "Vortex thermometers" are expected to save fuel in high speed aircraft by enabling planes to locate fast-moving jet streams that increase ground speed. The device, under development by Armour Research Foundation of the Illinois Institute of Technology for the Air Force, also will provide more accurate air temperature information for predicting weather conditions. Other applications of vortex tubes for aircraft fire control systems are being studied.

► **Martin's XP6M-1 jet SeaMaster has been undergoing flight tests for the last three weeks. Initial tests have been reported by the company as being satisfactory.**

► Messerschmitt advertisements in German magazines state the company is manufacturing cabinet rollers and sewing machines "and in future also again planes."

► **Convair's supersonic bomber, the B-58 Hustler, is proceeding on schedule, according to Gen. Edwin W. Rawlings, commander of the Air Materiel Command.**

► General Electric's J47 engine has undergone more than 20,000 design changes in the past eight years.

► **Britain's Ministry of Supply and Gloster both deny reports that the English Electric Canberra will be used as a night fighter until the Javelin comes into wide-spread operation. Reports grew out of the flight testing of a Mark 8 Canberra equipped with a nose-mounted radar dome. The Mark 2 Javelin is currently using a more powerful Sapphire engine than the one used by the Mark I.**

► Modification of the Bristol Olympus engine has been run on a test bed to 16,000 lb. thrust. The Olympus 106 and all succeeding modifications are designed for supersonic speeds.

► **Commercial air lines could get a much larger share of the USAF engine airlift program if they had the right type cargo planes for the mission. Air Materiel Command is eager to increase the amount of work done by contract carriers but cannot find companies which have the proper equipment.**

► An Aerojet Aerobee-Hi research rocket has carried 150 lb. of scientific instruments to an altitude of 180 mi., setting a record for single-stage rockets. During the International Geophysical Year, 22 Aerobee-Hi's will be fired at Ft. Churchill, Canada.

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Washington Roundup

Wilson Is Peeved, Too

Defense Secretary Charles E. Wilson is sympathetic with members of Congress who do not receive information on the comparative strength of the U. S. and Russian air forces.

Here is an exchange between Rep. Errett P. Scrivner (R.-Kan.) and Secretary Wilson during hearings on an Air Force request for additional funds:

Rep. Scrivner: ". . . All of us should get the same story. I do not know why anyone, whether in CIA (Central Intelligence Agency) or the Air Force Intelligence, or the aviation industry, or in the Air Force, should ever give Senator Symington or any other member of the Senate information that others of us apparently never get."

Sec. Wilson: "If you are sort of peeved at that, all I can say is 'move over and I'll join you.'

"I do not know how to stop it."

Rep. Scrivner: "When he comes out with statements such as he made on the floor of the Senate, which now do not appear to be factual, with no rebuttal from anyone in the Air Force—"

Sec. Wilson: "We have no rights on the floor of the Senate."

Rep. Scrivner: "You have around 500 men down there engaged in public relations work, and you have nearly $5 million to spend for publicity."

Sec. Wilson: "Yes, sir."

Harold Talbott, then Secretary of the Air Force, said that Sen. Symington did not get his information solely from the Air Force.

Another Pentagon Change?

Shift of Donald A. Quarles from Assistant Secretary of Defense for Research and Development to Secretary of the Air Force has resulted in Pentagon speculation that other changes are in the making. Generally, USAF is happy as indicated by the reaction to the Quarles appointment at the Air Force Assn. convention (see p. 12). In addition, there appears a strong possibility that the vacancy in the top R & D post will give Defense Secretary Wilson a chance to follow at least one of the Hoover Commission's recommendations.

The recommendation: that the offices of Assistant Secretary for Research and Development and Applications Engineering be combined. The Hoover report called their separation "unsound organization." Pentagon observers consider it unlikely that Frank D. Newbury, former Westinghouse official now filling the Applications Engineering post, will be the choice to fill the combined position if Wilson takes the opportunity to effect reorganization.

Presidential Flight

Sen. Warren G. Magnuson (D.-Wash.) has asked Civil Aeronautics Administration for details on the extensive protective and safety measures employed on President Eisenhower's trans-Atlantic flight to the "summit" meeting in Geneva. Measures reportedly included stationing a Navy cruiser every 400 mi. along the route in addition to U. S. Coast Guard vessels.

Present facilities for commercial trans-Atlantic flights have been the subject of strong criticism from pilots and airline executives. Present procedure in emergency communications consists of a call from the airplane to shore for information on the location of the nearest surface ship. The shore station in turn communicates with the surface ship, attempts to bring them together. No direct communication between the ship and aircraft is possible in most cases since the vessel lacks the necessary frequencies.

Navy's SeaMaster Stand

Navy bureaucrats have taken a new firm stand. They are against release of photos of the unclassified Martin P6M SeaMaster unless the plane is standing on the ground.

Flying pictures are out, despite the fact that the aircraft is a common sight to residents in the area of Middle River and Essex, Md. Navy says photos will not be released until seaplane has finished its "primary evaluation tests." Meanwhile, these residents have more snapshots than the Navy and the SeaMaster's flights are a common topic of conversation.

No Solution to No-Show

Scheduled airline traffic officials are still without industry-wide agreement on a solution to the increasing problem of no-shows and late cancellations. In the last four months, two futile attempts have been made to find an acceptable plan that will slow down the two major abuses of the reservations system. Latest effort failed at the Air Traffic Conference special Chicago meeting when the proposals submitted were rejected.

Next attempt to resolve the problem was left up to a new ATC special committee which has been instructed to report at the regular semi-annual meeting in November.

Prospects of agreement are considered brighter as the new eight man group is composed of the champions of individual company plans, which have been the biggest obstacles to unanimity.

CAB Doldrums

Tempo of activity at Civil Aeronautics Board has slowed to a virtual halt during August. The Board has cut its work schedule for the month to a bare minimum, and Chairman Ross Rizley is away for most of the month on an inspection tour of airlines located in the west. Activity should pick up sharply in the fall when the Board issues its decisions in such major proceedings as the New York-Chicago Case, the large Irregular Case and the Denver Service Case. All turn on important policy decisions and all are supposed to be decided by the end of the year.

'Official Use Only'

On June 1, 1954, a Department of Defense directive created a new classification "For Official Use Only" and set forth the purpose "to assure the proper custody, preservation and use of official information which requires protection in the public interest but which is within the purview of Executive Order No. 10501."

Latest Pentagon publication to carry the "For Official Use Only" classification: The Telephone Directory.

—Washington staff

AVIATION WEEK VOL. 63, NO. 8
AUGUST 22, 1955

Speed R & D, USAF Orders Industry

U. S. survival depends on 'exploratory development' for weapon systems advances, Gen. Power tells AFA.

By Claude Witze

San Francisco—The U. S. Air Force this year is challenging the American aircraft industry to meet the threat of Russia's spectacular gains in air power.

With the shadow of Red air power hanging over their four-day annual meeting here, more than 1,500 delegates of the Air Force Assn. heard these warnings and demands for action:

• **Lt. Gen. Thomas S. Power,** commander of the Air Research and Development Command, said our survival now depends on a "vast amount of exploratory development that will make big jumps possible in weapons system development."

• **Dr. H. Guyford Stever,** USAF's chief scientist, said Americans underestimate Russian scientific ability. He said facts brought to light earlier this year, which includes Soviet airpower demonstrations, are a "serious jolt to us all." To meet it, he said the aircraft industry must take "radically different" steps to improve the quantity and quality of engineers and utilize them efficiently.

• **Trevor Gardner,** USAF Assistant Secretary for Research and Development, said Congress will be asked for a supplemental budget of $100 to $200 million for R & D. To industry, at a closed meeting, he made the charge that the $2 million plowed back into basic research by five leading companies last year was a paltry sum, citing the year's sales of $3.7 billion and the backlog of more than $7 billion.

• **Roger Lewis,** USAF Assistant Secretary for Materiel, warned that the Air Force of 1960 to 1965 "is in the minds, on the drawing boards and in the prototype shops today." In a pointed reference to the industry, he said, "Development cannot be compressed, but it can be delayed by lack of purpose, confusion, misunderstanding and inattention."

• **Air Force Assn.,** in its annual statement of policy, said it assumes that Russia "is equal to or ahead of us in the development of ballistic missiles." AFA charged that while this situation exists, "Our own development programs proceed on a business-as-usual basis."

• **In addition** to improved quality, the Air Force is lifting its sights to provide more striking power. Gen. Nathan F. Twining, Chief of Staff, told the convention "we all know that a 137-wing Air Force is not a permanent solution to our airpower needs." (AW Aug. 15, p. 136).

Quarles Appointment

Offsetting this atmosphere of crisis in the field of aeronautical R & D was the announcement on the opening day of AFA's convention sessions that Donald A. Quarles had been named to replace Harold E. Talbott as Secretary of the Air Force (AW Aug. 15, p. 7).

The news came from Washington only a few hours before Gardner spoke to several hundred representatives of the aircraft industry. He made it clear that USAF could take encouragement from the fact that the Defense Department's top research and development expert had been named USAF Secretary.

Gardner pointed out this is the first time a man of Quarles' scientific stature has held the post, adding that the choice was appropriate in view of the growing Soviet menace. He said he had not consulted with Quarles about the need for supplemental R & D funds, but indicated that he expected the new chief to support the request when Congress reconvenes.

Slow Evaluation

Gen. Power, said the critical necessity for faster development is the major factor behind USAF's recent decision to eliminate design studies from the weapons system procurement procedure (AW Aug. 8, p. 12).

Following his meeting with aircraft industry leaders, Power said ARDC studies indicated that some of the major slippage in development of new weapons took place in the preparation and evaluation of the various paper proposals.

Power said that under the new Air Force procurement system whereby Phase I contracts have taken the place of preliminary design studies (AW Aug. 8, p. 12) an effort will be made "to increase the reservoir of development we have on the shelves."

Gen. Power did not put all of the blame in this respect on industry. He said frankly, in reply to a question by Aviation Week, that a great deal of

GE Reorganizes Engine Program

General Electric Co. is the first major defense contractor to announce it has reorganized its military business in keeping with the Air Force's demand for faster component development and a larger "reservoir of development" for tomorrow's weapon systems.

Jack S. Parker, manager of GE's Aircraft Gas Turbine Division, said the company is "planning powerplants which are not yet included in Air Force programs."

In step with Air Research and Development Command's demand that the engine development cycle be speeded to match that of the airframe makers, Parker said GE is making a new effort to plan products in advance of defense requirements.

"This," he said, "is part of the industry's responsibility in the military-industry partnership and is being increasingly encouraged . . .

I refer specifically to our program of planning far ahead—five, ten and more years—working out and proving the new principles of propulsion which we believe will eventually be needed. Such engine planning not only will yield superior products, but also permit us to schedule them economically, thereby protecting the mobilization base."

USAF emphasized it expects this philosophy to become widespread among all component makers, stimulating competition and resulting in design of parts that will be needed for more advanced weapons.

The remainder of GE's program:

• Establishment of permanent defense product divisions in the company. Technical talent no longer works on engines or electronic equipment as temporary duty.

• Increase in the amount of company money put into development facilities.

the lost time was spent by USAF in making its equipment evaluation.

"It takes so long," he said, "that by the time a winner is chosen it resolves down to, what is he the winner of?"

Gen. Power said that under the new system he still hoped that the minimum number of contractors chosen to produce a prototype will be given as much design freedom as possible.

Increase Development Reservoir

Then, he said, if the Phase I contract results in an item "that operates fairly within the state of the art we will push hard for production of a test quantity, and this will be more than two aircraft, to get them in the air as fast as possible."

About three months before the first flight, Air Materiel Command will take a good look at the long range production items and go after the selected component makers to discuss schedules.

Gen. Power emphasized the need for greater speed in developing engines, fire control systems and other electronic components. He said the airframe development cycle moves so much faster that these parts must be more advanced.

Component Competition

The ARDC commander said that such components in the future cannot be held under development for a single weapons system, but must be available in the most advanced form possible. This will call for a greatly increased amount of "exploratory development that will make it easier to take big jumps," he said.

This new approach, which gives a Phase I contract to a small and carefully selected number of contractors, clearly will raise points of dissension and discussion in the industry. Gen. Power says it is his intention to stimulate R & D activity by component makers, expecting them to compete heavily for the business when a prime contractor starts the search for a sub-system far enough advanced to fit the weapon system.

Some reaction from the component makers already indicates that they fear further encroachments into their specialized fields by the primes, despite declared USAF policy of discouraging this kind of activity.

Gen. Power said he believes the Russian advances of the past year, climaxing with the May Day aerial display over Moscow, were accomplished because the Reds have found a way to outpace America in synchronizing the development of components more closely with that of the airframe.

Roger Lewis supported this view. He told the convention that the five-to-eight year development cycle is too long. Major blame for this he attributed to exceedingly complicated communications and fire control equipment.

Dr. Stever gave perhaps the most definitive address of the meeting.

"We have already lost the engineering manpower battle," he declared. He pointed out that the Russians excel in all of the sciences that contribute to stronger air power.

He listed these items that speed the Soviet scientific march:

- **Russian production rate** of engineering graduates has more than doubled ours and in absolute numbers they have almost caught up with us.
- **The overall quality** of a Russian engineering graduate is equal to that of one from our own university system.
- **Differences in the two education systems** give all the advantage in the field of scientific and engineering training to their side.
- **Because they can direct their talent** into the fields where it is most needed, they employ their graduates more efficiently than we do in the U. S.

Dr. Stever said "we cannot win the race for technical air superiority unless something radically different is done.

"It seems to me that we now have no choice but to follow two courses of action, one to improve our educational system in order to get increased quantity and quality in science and engineering, the other to more efficiently employ those technically trained people we have. Both of these will take some doing."

In the course of using U. S. talent more efficiently, Dr. Stever indicated, USAF's new procurement policy under which design studies are eliminated, is an essential first step. His comment:

"The selection of the most promising weapons systems to development, and the planning which precedes the developments, became paramount items in the presence of limited technical manpower and development budgets.

Analysis and Reality

"Judicious selections and planning require considerable analysis. But here again we can easily be led to an unbalance if paper analysis and paper competition are carried too far. While important to lead our development lines, analysis can easily outrun reality.

"It is tempting to substitute paper analysis for real development. It can be, and probably has been in the recent past, overdone. Thus overdone, it constitutes a false economy, even though analysis is relatively cheap in terms of dollars.

"It is a false economy," he said "because such over-analysis requires a concentration of our best technical talent; when analysis is completed the development of the system still must be carried out in full.

"The average engineer's talents go a lot further in hardware development than in analytical studies for he can use greater help from the supporting elements of technology.

"To keep the balance between analysis and hardware development and to select our most promising development lines is again a great challenge to us," Dr. Stever said.

Industry Hedges on New Policy

San Francisco—Aircraft industry spokesmen last week expressed general agreement with Air Force elimination of preliminary design competitions but warned that such a system is open to abuse.

Gen. Edwin W. Rawlings, of the Air Materiel Command, and Lt. Gen. Thomas S. Power of the Air Research and Development Command, were both on hand at the Air Force Assn. gathering to explain the new procurement policy to industry leaders.

They emphasized that the main objectives are to speed weapons system development and reduce the time it takes to get new aircraft into the air—putting the U. S. in a more competitive position with Russia which has shown evidence recently of remarkably rapid development cycles.

Industry representatives were quick to point out that the new procurement plan should save both engineering manpower and money.

"We spent $3-million in one design competition," a Lockheed Aircraft Corp. official noted. But at the same time, industry spokesmen expressed concern over a number of phases of the plan's operation.

These were some of the questions raised by industry leaders who were asked by AVIATION WEEK to comment on the new Air Force policy:

- **Is there a danger** that such a system can lead to political abuse with awards to favored companies?
- **Does it mean that the U. S.** may miss out on some much-needed weapon because the company with the best idea is not the company with the contract?
- **Does it mean a closed-door policy** for anyone not already in the airframe business?
- **How will it affect** component manufacturers?

In some cases—as with the question of political abuse—the issue was raised only to be followed with a hopeful answer. Two typical responses, the second by J. G. Zevely, Convair sales director:

"The system is inherently dangerous, and there will be a temptation to abuse it. But there will not be much oppor-

tunity to do so—the awards will be too well scrutinized."

"The policy is open to abuse—but it is so open that it probably will not be abused for that reason."

Industry Fears

One well-known airframe executive called it a "step towards Socialism" but agreed that the reduction in development time may demand it. "But don't forget," he warned, "That if such a procurement policy had been in effect ten years ago, there would be no McDonnell Aircraft Corp. today."

Burton C. Monesmith, Lockheed vice president and California Division general manager, commented: "We still will have to spend money to develop new ideas and to sell the military services on new products. We still will build prototypes with our own money."

Lockheed last year tied up $12 million in pre-contractual obligations and eventually wrote $5 million of that off as lost, Monesmith said. As an example of a successful independent expenditure of the company's own money in a field where no design contract was held, Monesmith pointed to the T2V-1, originally designed for the USAF but eventually sold to the Navy. This type of expenditure will continue, he indicated, regardless of USAF's method of Phase I awarding.

The Lockheed executive's feeling that airframe firms would continue to spend generously of their own funds differed with the views of several others who felt that the new policy might discourage research and development with company funds at a time when USAF was trying to encourage it.

"Why should Boeing, for example, spend money on development of a new fighter when it knows that the Phase I contracts will go to those companies already active in the fighter field?" one executive asked. "And it might just be that the Boeing design would be superior."

Component Manufacturers

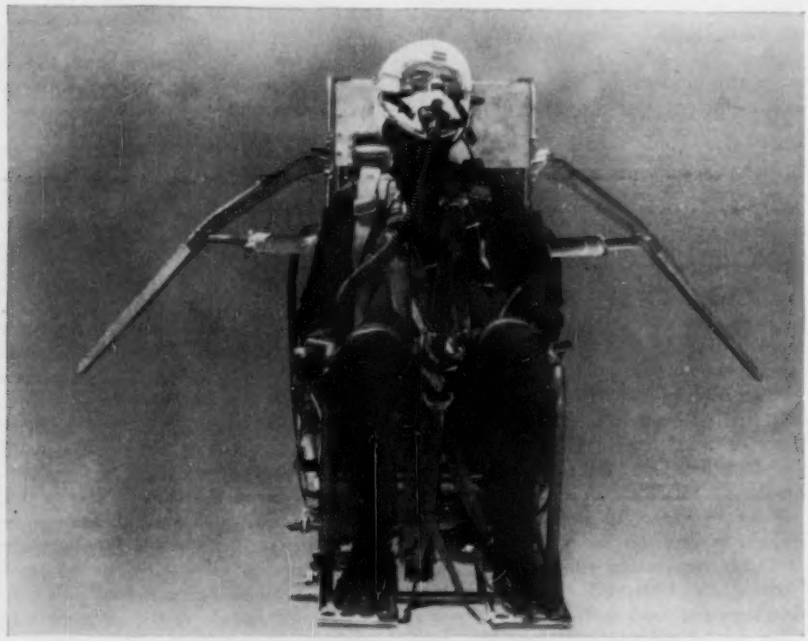
Several aircraft officials issued similar warnings that the tendency to by-pass companies with new ideas might be one of the pitfalls of the revised procurement program. This, in fact, seemed to be one of the major fears, that the program would tend to shut out new ideas, particularly those developed by firms outside the present airframe industry.

Component manufacturers for the most part were not certain how the change would affect them. The attitude of Homer H. Rhoads, president of Hydro-Aire, Inc., that "we have no concern over it—yet" seemed to reflect the wait and see feeling of most equipment and component manufacturers.

They were universally hopeful that it might eventually lead to elimination of expensive subcontracting design competitions—although they admittedly could not see how. One subcontractor pointed out that in many cases airframe companies have been conducting this same Phase I type competition among component manufacturers—but without providing contracts or money to support the projects.

"It would be exactly similar to our situation if the Air Force had told Lockheed, North American and Northrop they had been chosen to design long range interceptors—but told them to do it with their own money," he said. "We would like to see this policy develop to the point where it relieves us of some of these heavy development costs."

To sum up, industry agreed that the new Air Force policy would cut development time; thought it would save engineering man-hours, and hoped it would save money. While therefore welcome, it would require extremely capable and intelligent management by USAF.



Fins Stabilize Supersonic Ejection Seat

New Air Force emergency downward ejection seat for escape from supersonic aircraft has two stabilizing fins to keep it upright in supersonic, transonic and subsonic turbulences. In high-altitude bailouts, the pilot rides the seat down to 15,000 ft., is separated from it automatically, then is lowered to the ground by parachute. In lower-altitude bailouts, the pilot and chute are cleared from the seat in three seconds. The automatic sequence is triggered by two hand movements. The seat is part of an escape system engineered by Douglas Aircraft Co. in cooperation with ARDC as part of the X-3 highspeed research project. The system includes a protective helmet, redesigned clothing and built-in oxygen supply. The X-3 is undergoing tests at Edwards AFB under NACA's direction.

ODM Reviews Aviation Tax Write-Off Benefits

Office of Defense Mobilization is making a review to determine if investments in commercial aircraft and airport facilities should continue to be eligible for tax savings through rapid amortization.

Applications for quick tax write-off benefits in these two fields—and 36 others—will be suspended, pending the outcome of the review. Other applications which will be suspended include those for aluminum forging facilities, primary aluminum, and titanium metal.

According to ODM, these airlines have applications pending: American Airlines, $123.2 million; Capital Airlines, $64 million; Delta-C&S Air Lines, $2 million; Eastern Air Lines, $23.5 million; United Air Lines, $48.5 million; Northwest Airlines, $44 million; Western Air Lines, $15.5 million.

Programs in which expansion goals have not yet been met and which are still eligible for rapid tax write-off benefits, a total of 20, include: production facilities for military and atomic energy procurement, research and development laboratories, aluminum sheet producing and heat treating facilities, heavy aluminum aircraft forgings, mercury, nickel, scientific instruments, tapered aluminum sheet, titanium melting facilities, titanium processing facilities, welded aluminum tubing.

Tacan Release May Speed Single System

By Preble Staver

Washington, D. C.—Declassification of Tacan last week was a major step toward resolving the bitter controversy over which of two systems—military Tacan or civil VOR/DME—is to be used in the ultimate common civil-military air navigation system.

Ever since the inter-departmental and industry dispute erupted last February, the issue remained clouded by the secrecy surrounding Tacan. The security measures were imposed by the Navy, which developed the Tacan system under contracts with subsidiaries of International Telephone and Telegraph Corp. (AW Mar. 21, p. 77). After much prodding by Congress and attacks from opponents of Tacan, it was agreed to remove the security wraps.

A final delay developed only last week with a five-day spread between the declassification action and the eventual release of Tacan's operational and technical characteristics. Declassification required coordinated action between the U. S., Canada and United Kingdom. Information of the system followed only after IT&T was given time to file world-wide patent rights.

200-Mi. Range

All technical details of Tacan are now channeled through the Air Navigation Development Board. In addition to the long range benefit of explaining the Tacan system, immediate advantages include:

- **Pilots** will know what to expect from the system as well as how it works.
- **Engineers** also are told for the first time what the system consists of in the way of components and how it works.

Tacan is described by ANDB as an integrated and distance radio navigation aid, operating in the frequency range from 962 to 1,213 megacycles, which is capable of providing navigation information to a line-of-sight distance of 200 nautical miles.

The system can provide a bearing accuracy of better than plus or minus 1 deg. and a distance accuracy of plus or minus 600 ft., plus .15% of the distance measured, when the antenna of the ground equipment is sited for optimum results. (Optimum siting requires a tower to assure that the radiated energy from the ground equipment clears all nearby objects.)

ANDB noted that the cone of confusion of the present system is 110 deg. but expressed the hope that this angle will be decreased in subsequent models. It was further pointed out that voice communication is not included in the Tacan system although added service is now possible in the channel used.

The Tacan system consists of an airborne unit (AN/ARN-21) and a ground or shipboard unit (AN/URN-3).

The airborne equipment set consists of a receiver, transmitter and auxiliary equipment. This set mounts in a single rack, weighs 65 lb., including shock mounting, contains 76 tubes and uses 500 watts of power. It occupies a space of less than one cubic foot. A further breakdown gives the transceiver unit as consisting of 11 removable sub-assemblies, five of which are the plug-in type containing the various decoding and tracking circuits. In addition, there are three indicators involved, the ID-310, for distance display, the ID-250 for bearing information, and the ID-249, which is a combined course selector-deviation indicator. A control box and antenna complete the unit. Cockpit presentation is identical to that of the civil VOR/DME.

The ground unit of Tacan is contained in the equivalent of two relay racks six feet high and uses 13 kilowatts of 110/220-volt 3-phase power. The ground unit antenna and drive motor assembly is six feet in height and three and one-half feet in diameter. The outer cylinders of the ground antenna assembly contain the parasitic elements which rotate at 900 rpm. to provide modulation of the signal to give bearing information. Total weight of the ground units is approximately 1,100 lb.

The ground equipment can transmit on any one of the 126 one-megacycle channels in the frequency ranges 962-1024 and 1151-1213 megacycles. The ground receiver operates on a frequency 63 megacycles above the transmitter frequency in the lower range (channels 1-63), and 63 megacycles below the frequency in the higher range.

The composite azimuth and distance reply signal transmitted by the ground beacon consists of 3.2 microsecond pulses transmitted in pairs with a pulse spacing of 12 microseconds. A total of 3,600 pulse pairs are transmitted per second, of which 2,700 of these are random in time and include replies to distance interrogations from aircraft.

The remaining 900 pulse pairs consist of 12 pairs of pulses spaced 30 microseconds (known as the main reference pulse group) and eight groups of six pulse pairs (known as auxiliary pulse reference group) spaced 24 microseconds and transmitted 15 times per second as antenna rotates. Morse code identification is provided by keying the transmitter so as to substitute a fixed repetitive rate of 2,700 pulse pairs per second for random pulse pairs when the key is down.

Tacan Symposium

Air Navigation Development Board will sponsor a symposium in Washington during October for a technical discussion of the Tacan system. The complete technical symposium is to provide more information and greater detail of Tacan's operation than is now available.

To provide azimuth information the pulsed radio frequency output of the transmitter is amplitude modulated by the antenna system. The antenna consists of a vertically polarized stationary array around which rotate, in a clockwise direction, two sets of parasitic elements contained in the cylinders.

The inner cylinder contains one parasitic element and modulates the pulse amplitude at the receiver at 15 cycles per second. The other cylinder contains nine parasitic elements and superimposes a 135 cycles per second modulation on the fundamental 15 cycles per second modulated signal. The bearing of an aircraft with respect to the surface beacon is determined at the aircraft by comparing the time of occurrence of the reference pulse groups to the phase of the amplitude modulation of the ground antenna rotation.

Time Interval Measurement

The random pulse-pairs are triggered by noise when no signal is received by the ground receiver, but if a pulse-pair with 12 microseconds spacing is received, the ground transmitter replies to it. Thus the distance of an aircraft from the beacon is determined in the aircraft by measuring the time interval between an interrogation and the reply.

The Tacan airborne receiver operates in the same frequency range as the ground transmitter. For bearing information the signal in the set is demodulated and separated into 15 and 135-cycle components in connection with other reference signals. The 15-cycle azimuth circuits first measure the phase difference between a reference signal and the 15-cycle envelope and so position the bearing pointer to the correct 40 deg. sector. In the aircraft this provides a coarse and fine system which theoretically results in nine times the accuracy of a single antenna lobe system.

In distance measuring, the airborne receiver, while sending interrogations in pulse pairs, searches for reply pulses.

Once the reply pulses are found, the receiver automatically tracks them, converts the time delay to miles, and continuously indicates range on a dial.

GLUM, Talbott and Wilson . . .

SMILE, at medal ceremony.

Talbott: Praised and Criticized

The career of Harold Talbott as Secretary of the Air Force closed with high public praise—and a promise of further investigation in the next Congress by one senator.

In addition to being awarded the Medal of Freedom – Defense Department's highest civilian award—in a public ceremony, there were these developments following Talbott's recent resignation:

• **Roger Lewis,** who recently resigned as Assistant Secretary of the Air Force for Materiel, applauded Talbott as "honest, forthright" and one who "acted always as he thought entirely proper" in an address presented to the annual convention of the Air Force Association (p. 12).

• **The Senate Permanent Subcommittee on Investigations,** which held the hearings which ultimately resulted in Talbott's resignation, firmly closed the door on any further investigation. They observed in a formal and unanimous statement that the issue was the propriety of Talbott's actions and that this was "satisfactorily resolved" by his resignation.

• **Sen. Wayne Morse (D.-Ore.)** declared that he will "insist" on an investigation of the conflicting interests of businessmen serving in the Eisenhower Administration by the Banking and Currency Committee of which he is a member. He anticipated that Talbott and Roger Kyes—who served approximately one year as Deputy Secretary of Defense and then returned to his former position as vice president of General Motors Corp.—would be key figures in the investigation.

Praise from Lewis

Reporters noted that Lewis in delivering his speech to the Air Force Assn. omitted four paragraphs in praise of Talbott which were in the prepared text. Lewis in his spoken address said:

"Harold Talbott has left the Air Force after more than two and a half years of devoted service as its secretary. As his Assistant for Materiel during this entire period, I worked intimately with him and know that he is honest, forthright, and acted always as he thought entirely proper. I would like to add my own testimonial to all the fine things that have been said about him and the job he has done.

"Harold Talbott was an outstanding Secretary of the Air Force. He was courageous, earnest, tireless. He devoted his very great energy and his time without reserve to the interests of our national security."

The formal statement of the Senate Investigations Subcommittee observed that before it were "certain allegations that Mr. Talbott in his position as Secretary of the Air Force had perhaps indulged in unethical or improper conduct on behalf of Paul B. Mulligan & Co. of which firm he was a partner.

Committee Closes Hearings

"Mr. Talbott, after having had an opportunity to reflect on evidence developed during hearings submitted his resignation . . . which has now been accepted.

"Accordingly the subcommittee decided that this matter had been satisfactorily resolved. Therefore with the issuance of this statement, the investigation is concluded."

Upon taking office, Morse declared, "Messrs. Wilson, Kyes, Stevens and Talbott not only did not anticipate the problem (of conflicting interests), but they initially resisted divesting themselves of substantial holdings in corporations with which the Defense Department dealt. Finally and with reluctance they surrendered their stock holdings. Each one demonstrated callous lack of understanding of the conflict of interest problem."

"Testimony shows," Morse charged, "that Talbott consciously and willfully misused his office as Secretary of the Air Force."

Talbott Piqued at Wilson, Denies It

Harold Talbott spiced his last hours as Secretary of the Air Force with a bitter verbal thrust at Secretary of Defense Charles Wilson, for failing to do "one thing to defend me."

Reporters heard it, and it was widely publicized, along with Talbott's denial of the episode.

At a press session called to introduce incoming USAF Secretary Donald Quarles, Talbott led Wilson aside. While photographers were busy photographing Quarles, newsmen reported Talbott told Wilson: "I don't like what you said at your news conference (two days previous) about being distressed about the whole business of my resignation." Then, before Wilson replied, Talbott reportedly added, "You haven't done one thing to defend me."

A denial issued by aides indirectly quoted Talbott:

"He had asked Mr. Wilson to step in the corner so he could congratulate him on his appointment of Donald Quarles . . . and to tell him how pleased he was personally with the appointment. He further stated that the idea of his accusing or criticizing Secretary Wilson of anything is incorrect."

Two pictures taken at the press conference showed Talbott and Wilson, first, in what appeared a glum interchange, and, later, in smiling form with Quarles.

This is Wilson's verbatim comment at his press conference:

Reporter: "Mr. Secretary, are the circumstances of Mr. Talbott's leaving causing a review of the financial involvements of other members of the Defense Department team?"

Mr. Wilson: "I am not conscious of it at all."

Reporter: "Are you happy about Mr. Talbott's resignation?"

Wilson: "I was very distressed about the whole business. I don't like any part of it."

Reporter: "Were you distressed about allegations made against Mr. Talbott or . . ."

Wilson: "Just like I said. I didn't like any part of it. It was a very distressing matter. I feel like I have gotten one year older in the last three weeks, and just for the record, this erosion business seems to work on secretaries also."

First Details on Convair's Jet Transport

By William Coughlin

San Diego, Calif.—Convair's proposed jet transport—of which the first publicly-printed artist's sketch appears above—closely resembles the Douglas DC-8 and Boeing 707 and would be capable of ferrying between 80 and 135 passengers on 550 mph. trans-Atlantic flights.

The swept-wing transport would be powered by four Pratt & Whitney JT3L engines—each providing 11,000 lb. thrust—mounted in pods swept sharply forward from the leading edge of the wing. The maximum passenger load would depend upon configuration and seat arrangement.

Convair has submitted its proposal for such a plane to the airlines but says it is not "actively" engaged in a jet transport sales campaign because of its belief that the current jet transport market is limited.

With perhaps only 100 planes in the picture for the first round of jet orders, the feeling at Convair is that there will not be enough business for even two companies, let alone three. Conceding that Douglas Aircraft Co. with its DC-8, and Boeing Airplane Co., with the 707, have an edge at this time, Convair spokesmen say they are not anxious to try for a three-way split on forthcoming airline orders. "We would be better off putting the same effort into military projects," a sales executive explained.

The Convair jet is of a fairly conventional design. Its nose has a more slender taper, however, than either the Douglas or the Boeing configurations and vertical tail is placed slightly forward exposing a portion of the top surface of the fuselage end.

The Convair design, although weighing in at a gross of well over 200,000-lbs., would be able to operate from existing major terminals.

Its route times would be comparable to those of the Boeing and Douglas aircraft: Los Angeles to New York, four and one-half hr.; New York to Paris, six and one-half hr.; Honolulu to San Francisco, four hr. plus.

Economics of operation would be similar to those of its competitors.

The J57 was recently certificated for commercial use by the Civil Aeronautics Administration under the designation of JT3L but military restrictions on its details have not yet been lifted.

Commenting on the similarity of the three jet transport designs, a Convair official said, "When you use the same engine, you are bound to come up with designs that are much alike."

Howard Hughes was reported several weeks ago to be interested in the Convair design for Trans World Airlines but more recent reports on the TWA negotiations indicate that no final agreement has been reached.

And earlier reports that Convair's jet transport entry was a delta-winged design may have resulted from an Air Force study which the company conducted some time ago on a military transport version of its delta-wing supersonic B-58 bomber.

Convair believes that one of the

factors limiting the present jet transport market is that west-bound trans-Atlantic flights against headwinds will present a considerable problem. Although this aircraft, like its competitors, is designed for nonstop operations to Europe, loads would be sharply reduced under unfavorable wind conditions. The company believes this factor will cause international carriers to move slowly on their jet orders.

Another factor is that—in order to make present designs adaptable to future engines of higher thrust and better specific fuel consumption—considerable redesign will be necessary. This would boost present asking prices by a considerable margin, according to a Convair spokesman.

Continental To Get Local Route Certificate

Civil Aeronautics Board has proposed permanent certification of Continental Air Lines' local service Route 64, which was acquired in the absorption of Pioneer Air Lines by Continental last April.

CAB named 16 cities in Texas and New Mexico as warranting permanent service by Continental while another seven points would continue to be served under the temporary authorization.

In the absence of objections within 15 days, the Board order then will become final.

Continental is eligible for permanent certification of Pioneer's former local service route. The Board is not at the present required, however, to grant permanent local service authorizations to more than one-half of the intermediate points asked for by any one applicant.

ALPA Seeks Changes at Midway

Air Line Pilots Assn. called for immediate correction of certain conditions at Chicago's Midway Airport at the conclusion of the Civil Aeronautics Board investigation of the July 17 crash of a Braniff Convair.

An ALPA Air Safety Committee said it couldn't determine a probable cause of the accident which took 22 lives. But the group urged CAB to take immediate remedial action on a number of undesirable conditions at Midway.

The committee asked CAB to consider seven points:

- **Midway's approach light system** and runway marking system are sub-standard and don't conform to Civil Aeronautics Administration standards.
- **Weather conditions** should be observed at runway extremities rather than at distant points. ALPA says runway conditions reported at the time of the Braniff accident were based on observations made more than a mile away.
- **Pilots consider Midway's runways** unusually slippery and call them poor when dry, bad when wet. ALPA says the majority of pilots regard the runways as short, slippery, bumpy and obstructed.
- **Braniff's Convair** had two different types of instrument landing system indicators which may have led to momentary indecision in the cockpit in choosing the instrument to follow.
- **Available facts indicate** that during the last five seconds of flight the Braniff aircraft's rate of descent was about three times the normal rate.
- **Midway should be re-surveyed** immediately to correct or eliminate present obstructions which exist both inside and outside the airport boundaries. ALPA singles out concrete runway markers as the cause of previous accidents and a contributor to the damage in the Braniff crash.
- **Airport fences** and other obstructions, including approach light structures, should be made with frangible mountings which break when struck, rather than the present resistant type.

Trunklines Cut Fares On East-West Routes

Trans World Airlines startled the airline industry last week with a drastic fare cut for aircoach service between major points on the East and West Coasts.

The airline scheduled a $160 roundtrip excursion fare between New York, Philadelphia, and Washington and San Francisco and Los Angeles, a 20% cut from the present fare. Boston-Los Angeles and San Francisco fare is $178.80 roundtrip. The new fare schedule is effective Sept. 12.

American Airlines and United Air Lines matched the TWA tariff within a few days. American cut its coach fare to $160 between eastern points New York, Philadelphia and Washington and San Francisco, Oakland, Los Angeles and San Diego on the West Coast. American asked Civil Aeronautics Board for permission to make the new fares effective Sept. 12 to match TWA's starting date.

United's coach fares are cut to $160 roundtrip between New York-Newark, Philadelphia, Baltimore and Washington and West Coast points San Francisco-Oakland and Los Angeles. The United tariff will become effective Sept. 16.

Fares for both American and United between Boston and the West Coast are identical to TWA's $178.80.

The new fares, equal to those charged by North American Airlines for nonsked service, are good Monday through Thursday on an excursion plan. The $160 fare applies only to a roundtrip flight completed within thirty days.

The tariff reductions filed by the three transcontinental carriers are subject to CAB approval. The Board has the option of suspending the fares for investigation anytime before they go into effect.

Aussies Build Copter

Molyneux XM1000, first helicopter to be designed and built in Australia, will begin flight tests next October. The two-place copter is the prototype for a five-passenger air taxi that Molyneux plans to construct next year.

Slick, Seaboard Order 1049H

Slick Airways and Seaboard & Western Airlines have ordered a total of seven Lockheed Aircraft Corp.'s all-cargo 1049H Super Constellations, confirming a prediction by Aviation Week that the two airfreight carriers would buy the transport (June 27, p. 91).

Slick placed an $11-million contract for five of the freighters and Seaboard purchased two 1049Hs with a total value of $4 million.

Both carriers said the new orders reflect increasing air cargo business. D. W. Rentzel, Slick board chairman, predicted the 1955 volume for his domestic carrier would total approximately 43,154,000 ton-miles, 32% more than last year's 32,776,000. S&W President Raymond A. Norden forecast "tremendous expansion" of trans-Atlantic airfreight. Addition of the 1049Hs, he said, will increase Seaboard's annual ton-mile capacity by 18 million to a total of 142.5 million.

Slick's Super Connies will be delivered during the first three months of 1957, increasing its fleet to 28 transports. The carrier now operates three Douglas DC-6As, three DC-4s and 17 C-46s. Seaboard will receive its 1049Hs in January 1957. It presently operates four 1049D Super Constellations and six DC-4s.

For domestic operation, Slick plans on a maximum 1049H payload of more than 40,000 lb. Seaboard's peak payload for trans-Atlantic flights will total about 35,500 lb.

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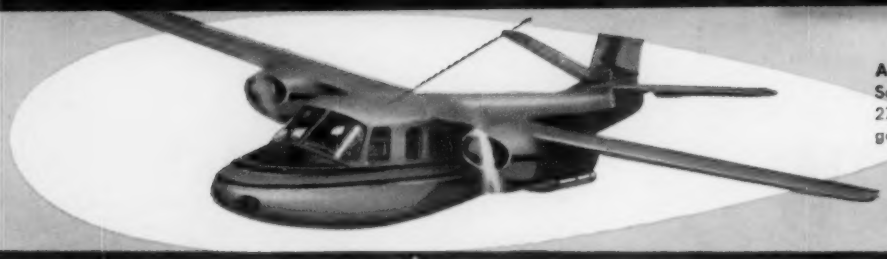

Aero-Commander. Seats 5 to 7. Powered by two 270-h.p. Lycoming air-cooled, geared engines.

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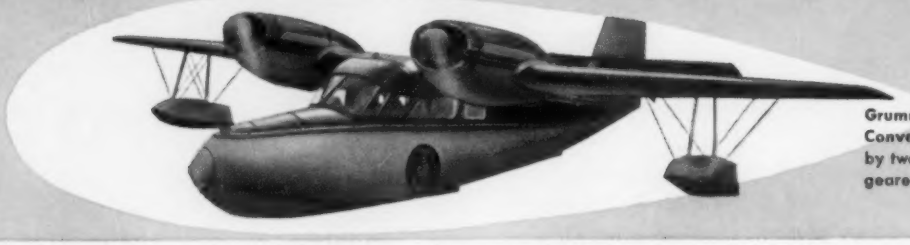

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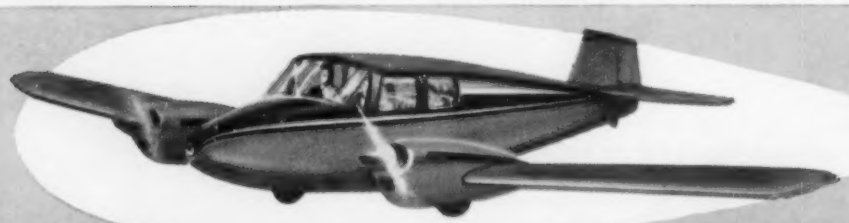
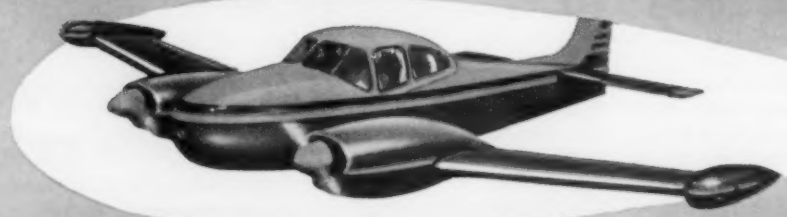
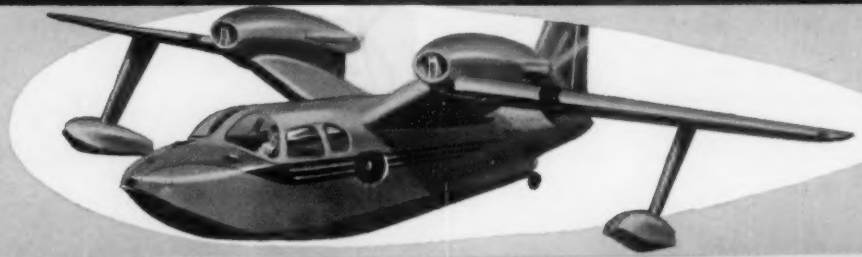


Piper Apache. Seats 4. Dependably powered by two 150-h.p. air-cooled Lycoming engines.



Riley 55. Seats 4. Powered by two 170-h.p. air-cooled Lycoming engines.



Royal Gull. Seats 5. Powered by two 270-h.p. air-cooled Lycoming engines.

HELIPORT FOR SHORT-HAUL flights as designed by German planner Lothar Prang.

Convenient Roof Ports a Must For Economical Helicopter Flights

Rotterdam—Aircraft experts from 14 countries attending the recent Helicopter Congress here urged the construction of more and better roof heliports and agreed that the future economy of a helicopter traffic system will be determined by the location of its landing sites.

Lothar Prang, town planning expert and heliport designer of Duesseldorf, Germany, told the Congress—held here July 29-30 under the auspices of the Rotterdam Helicopter Syndicate—that a passenger-freight heliport, to be successful, should be no further away from the local market than the railroad station.

Prang's studies of the passenger-freight heliport also led to the following conclusions:

- Loss of time because of a distant landing site cannot be compensated for, even by a considerable increase in the cruising speed of the commercial helicopter.
- If the heliport is five minutes away from the center of its market, it is possible to achieve average rates enabling short-distance air traffic to compete with surface traffic.
- Inherent advantage of elevated or roof landing sites is that they require limited surface space.

Enlarging upon the latter point, Prang said that an elevated site requires an area of 80 x 120 meters, whereas a level surface site with the same useful surface requires 220 x 380 meters, including extra running space and safety areas. He added:

"Injury to the divergent interests of neighboring inhabitants; the inconvenience caused by noise and approach spaces; the absence of obstacles; the possible shifting of a city's economic center through town planning or growth; the creation of fast approach streets to landing sites; determination of dimensions in view of probable future traffic density; possibilities for extending the landing sites; and local meteorological conditions are among the problems to be studied in selecting heliport sites.

J. S. Shapiro, independent consulting engineer on helicopters from London, said he regarded the roof heliport as "the only heliport worthy of future consideration. The future of the helicopter, Shapiro said in his address, "is based on the very fact that it can provide a great improvement in transport without adding to the land requirements of the city."

Shapiro told the Congress that "any deviation from the center of the city in the truest sense of the word is a great sacrifice in the utility of the helicopter." The width of the landing area of any heliport, he said, should not be less than twice the track of the undercarriage of the landing helicopters.

"A capacity of 40 seats," he added, "seems to be near the maximum which can be allowed for inter-city services of reasonable frequency. Whatever the place of the giant among helicopters, the place of the helicopter among the amenities of a city is assured in the guise of a moderate size vehicle, and architects of heliports need not take more trouble over the prospects of pronounced increases in size than architects of railway stations over the pros-

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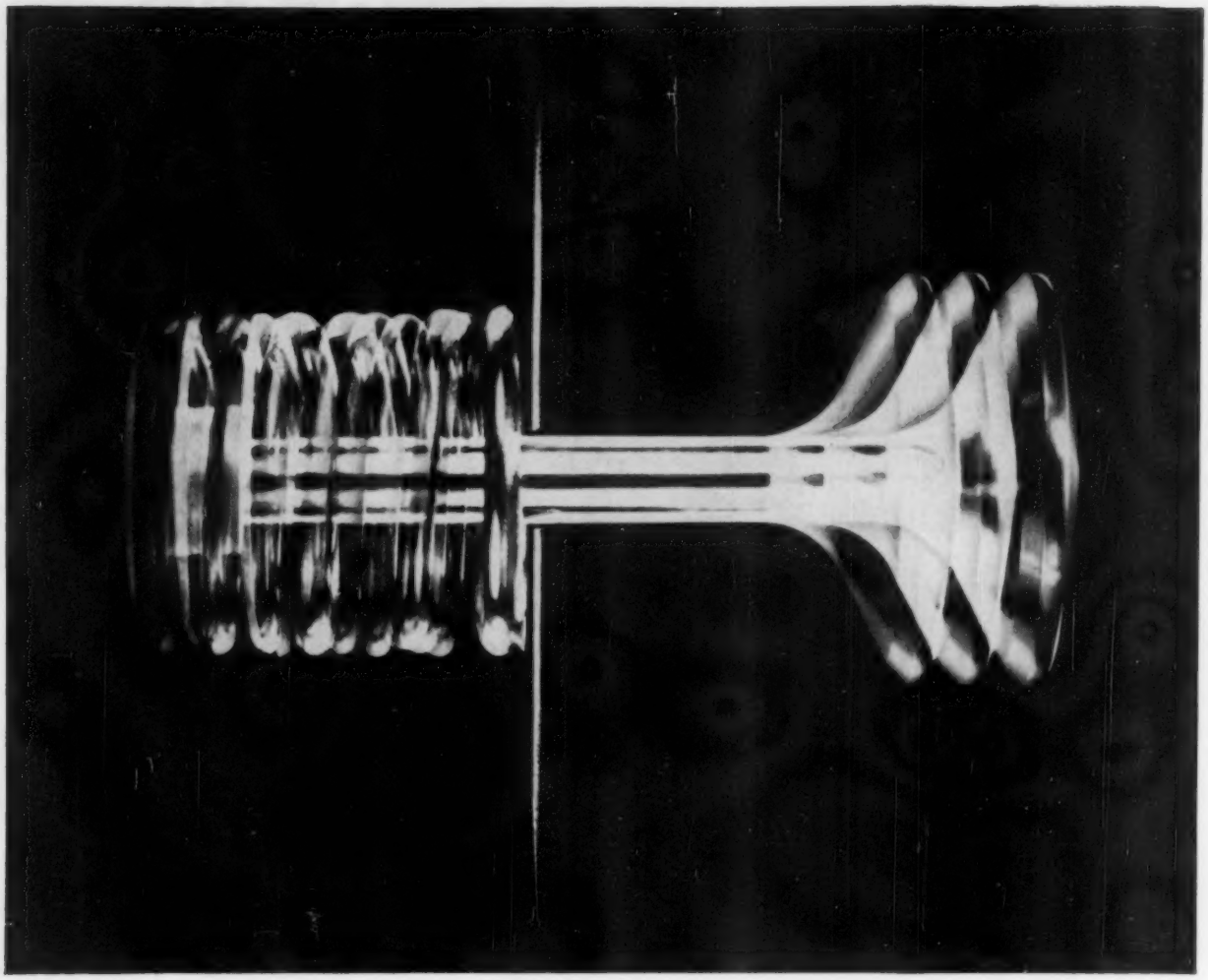

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pects of increasing the width of the track.

"Helicopters can, should and will be silenced as buses are. It is difficult to believe that by transporting the same passengers at a higher altitude the noise problem is increased. In fact if there is a specific helicopter noise problem it is psychological." It may be that people will come to accept the noise as helicopters become more common.

J. A. C. Tillema, municipal surveyor of Rotterdam, told the Congress he considered the location of Rotterdam's heliport particularly good because "it is located in the heart of the city, it is within walking distance of the main railway terminals, the town hall, the Chamber of Commerce and the stock exchange. In addition, he said, "It is near the big north-south highway running from France and Belgium to the heart of western Holland. There also are a good many bus and tramway stops in the neighborhood, while ample parking space is provided."

Tillema explained that a secondary landing area has been provided outside the built-up area of the city in case the pilot fears an approach over the congested area under bad weather conditions.

"Operation of this heliport is commercially not a success," he said. "The interest of the capital invested together with normal operation costs such as heating, electricity and staff, are a heavy burden. Commercial operation to some extent may be within reach when in the future frequencies will be stepped up and bigger aircraft flown. Until now, this heliport should be considered as a necessary asset to the city's transport and communication system."

Arab League Plans Civil Air Buildup

Beirut, Lebanon—The Arab League Secretariat has drafted a new agreement outlining a unified civil aviation development program for its members in what observers believe to be the first step towards the formation of a single Arab aviation company comprised of a merger of all current air activities.

The draft agreement suggests improvement in airport facilities in Egypt, Lebanon, Iraq, Syria and Jordan. Some of these have actually been started or are nearing completion. Work suggested and/or under way include:

- Construction of a new runway and lengthening of another at Cairo International Airport. These projects are nearly completed along with the installation of equipment for instrument landing. Airport improvements also are being made at Luxor.
- Projects asked of Lebanon have been completed including new terminal and instrument landing facilities. Lebanon reports for the first half of this year 14,710 landings and takeoffs and 175,552 passenger arrival and departures at Beirut International Airport as compared with 12,231 landings and takeoffs in the same period last year.
- Another airport at Baghdad to supplement present facilities.
- Pending construction of a new international airport at Damascus, the Syrian government is asked to lengthen runways and improve other facilities at the current field.
- Jordan already has built a new runway at Amman Airport and is enlarging Jerusalem Airport's runway.

Surplus C-82 Overhaul Starts

First of a group of surplus Fairchild C-82 Packets bought from Air Materiel Command by L. B. Smith Aircraft Corp. begins "demobilization" process at Miami International Airport. The planes will be overhauled and resold to operators in Latin America, Africa and the Near East. Smith Aircraft engineers say that removal of certain military equipment has increased the Packets' payload and overall efficiency. AMC sold 93 of the surplus C-82s to various purchasers for a total of close to $840,000. Other planes to be disposed of include 19 Northrop YC-25 Raiders, 42 Beech T-7s, 137 T-11s and 129 C-45s (AW May 16, p. 20).

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Recent Stock Changes As Reported by SEC

Acquisition of 14,300 common shares of Glenn L. Martin Co. stock by J. B. Wharton, Jr., a director of the company, was reported in a summary of security transactions by Securities and Exchange Commission. Other transactions include:

• **Aero Supply Mfg. Co., Inc.** Disposal of 4,000 common shares by William H. Coleman, director, leaving an indirect holding of 15,485; disposal of 500 common shares by Henry M. Margolis, director, leaving a holding of 15,200.

• **Alaska Airlines, Inc.** Acquisition of 400 common shares by Frank C. La Grange, director, making a holding of 7,200; acquisition of 200 common shares through compensation by Ralph W. Starkey, officer, making a holding of 200.

• **Allegheny Airlines, Inc.** Disposal of 600 common shares by Robert M. Love, director, leaving a holding of 19,400.

• **American Airlines, Inc.** Disposal of 24,800 common shares by the late Amon G. Carter, director, leaving a direct holding of 25,200; acquisition of 9676 common shares by the late Amon G. Carter, director, making an indirect holding of 62,176; disposal of 200 common shares by Theodore P. Gould, officer, leaving a holding of 1400; acquisition of 500 and disposal of 2,000 shares of 3½ pc convertible preferred by Amon G. Carter (Employees Fund) leaving no holding; month end holdings of $500,000 of 3 pc debentures of Amon G. Carter (Employees Fund).

• **Bell Aircraft Corp.** Acquisition of 400 common shares by Julius J. Domonkos, officer, making a holding of 2,800; acquisition of 400 common shares by William G. Gisel, officer, making a holding of 700.

• **Braniff Airways Inc.** Acquisition of 3,159 common shares by C. G. Adams, officer, making a holding of 12,059; acquisition of 3,500 common shares by Charles E. Beard, officer and director, making a holding of 13,500; acquisition of 23,665 common shares by William A. Blakley, director, making a holding of 90,270; acquisition of 1,700 common shares by George A. Butler, director, making a holding of 6,700; acquisition of 970 common shares by R. V. Carleton, officer and director, making a holding of 3,880; acquisition of 333 common shares by Fred Jones, director, making a holding of 1,333; acquisition of 531 common shares by Milton McGreevy, director, making a holding of 1,531; acquisition of 2,066 common shares by R. C. Shrader, officer and director, making a holding of 8,266.

• **Capital Airlines, Inc.** Disposal of 575 common shares by J. H. Carmichael, officer, leaving a holding of 2,475.

• **Chance Vought Aircraft.** Acquisition of 500 capital shares by Leonard F. McCollum, director, making a holding of 500.

• **Colonial Airlines Inc.** Disposal of 100 capital shares by B. T. Dykes, officer and director, leaving a holding of 705.

• **Douglas Aircraft Co. Inc.** Disposal of 1,000 common shares by Donald W. Douglas, Jr., officer and director, leaving a holding of 1,250.

• **Flying Tiger Line Inc.** Disposal of $5,000 of 5½ pc convertible debentures by William E. Bartling, officer, leaving a holding of $50,000.

• **Garrett Corp.** Acquisition of 415 common shares by W. D. Morgan, officer and director, making a holding of 5,035.

• **General Dynamics Corp.** Disposal of 700 common shares by O. Pomeroy Robinson, Jr., officer and director, leaving a holding of 4,448; acquisition of 4,750 common shares by Carleton Shugg, officer, making a holding of 7,150.

• **General Electric Co.** Acquisition of 100 common shares by Gilbert W. Humphrey, director, making a holding of 100; acquisition of 3,225 common shares through exercise of option by Roy W. Johnson, officer,

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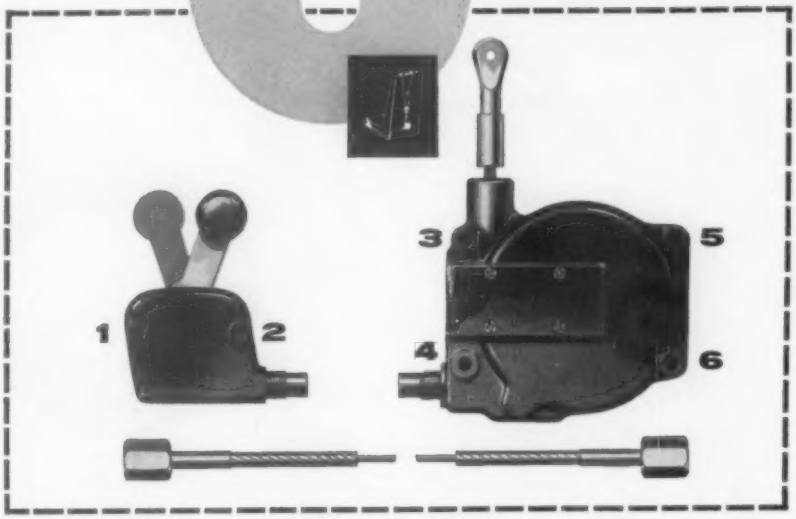

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PACIFIC SCIENTIFIC — PIONEERS IN AIRCRAFT INSTRUMENTATION AND ACCESSORIES SINCE 1919

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Please send me Bulletin MH-1 with complete details and specifications on Pacific's new Harness Reel.

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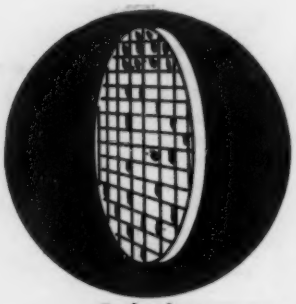
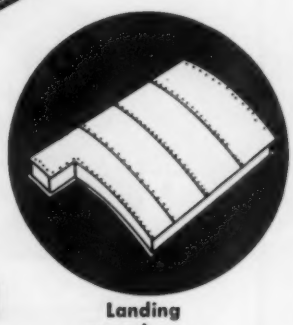
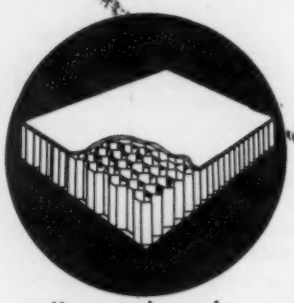


Radar lens

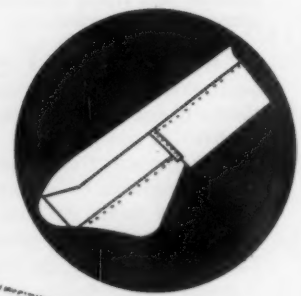


Landing gear doors

Let Continental help you meet "air age" production schedules



Honeycomb panels



Flaps

Are overloaded shops or processing problems threatening your production schedules? Remember, Continental is equipped and ready to take these worries off your mind. As producers of a complete line of aircraft components, Continental has both the skill and facilities to give you top quality work—on time.

Why not put our skilled technicians, and production know-how, to work for you. They're available now. Write, wire or phone Howard Bilderback, Mgr. Sales Engineering, at address below.

CONTINENTAL CAN COMPANY

PLANT 95 Coffeyville, Kansas

making a holding of 6,726; acquisition of 2,070 common shares by Ray H. Luebbe, officer, making a holding of 2,250; acquisition of 1,600 common shares by Donald L. Milliham, officer, making a holding of 2,609; acquisition of 1000 and disposal of 500 common shares by W. V. O'Brien, officer, leaving a holding of 801; acquisition of 600 common shares through exercise of option by Gerald L. Phillippe, officer, making a holding of 1,622; disposal of 1,545 common shares by Willard H. Sahloff, officer, leaving a holding of 465; acquisition of 1,875 common shares through exercise of option by Harold F. Smiddy, officer, making a holding of 3,750; acquisition of 1,185 common shares by Arthur P. Vinson, officer, making a holding of 3,019.

• **General Motors Corp.** Disposal of 275 common shares by Paul Garrett, officer, leaving a holding of 871; disposal of 517 common shares by James E. Goodman, officer, leaving a holding of 3,029; disposal of 497 common shares by John F. Gordon officer and director, leaving a holding of 1,601.

• **Lear, Inc.** Acquisition of 14,516 common shares through exchange or conversion by William P. Lear, director, making a holding of 420,857; disposal of 21,774 preferred shares, his total holding, through exchange or conversion by William P. Lear, director.

• **McDonnell Aircraft.** Disposal of 100 common shares by Kendall Perkins, officer and director, leaving a holding of 1,100.

• **Minneapolis-Honeywell Regulator Co.** Disposal of 6,000 common shares by H. W. Sweatt, director, leaving a direct holding of 116,340 and an indirect holding of 7,030; disposal of 1,100 common shares by John J. Wilson, officer and director, leaving a holding of 94,700.

• **Northrop Aircraft Inc.** Disposal of 1,000 common shares by John W. Myers, officer and director, leaving a holding of 2,054.

• **Northwest Airlines, Inc.** Disposal of 1,500 common shares by J. H. Binger, director, leaving a holding of 2,924; disposal of 500 shares of 4.6 pc cumulative convertible preferred shares by Malcolm S. Mackay, officer and director, leaving a holding of 2,500.

• **Pacific Northern Airlines.** Acquisition of 1,000 common shares by Robert A. Rowan, director, leaving a holding of 14,667.

• **Pan American World Airways Inc.** Acquisition of 1,250 common shares through exercise of option by Erwin Balluder, officer, making a holding of 16,735; disposal of 4,400 common shares by Robert Lehman, director, leaving a direct holding of 1,300 and an indirect holding of 5,600; acquisition of 625 common shares through exercise of option by Andre A. Priester, officer, making a holding of 5,071; acquisition of 875 common shares through exercise of option by John S. Woodbridge, officer, making a holding of 1,546.

• **Philco Corp.** Disposal of 2,500 common shares by James T. Buckley, director, leaving a holding of 13,252; acquisition of 3,000 and disposal of 198 common shares by the Profit Sharing Plan of Philco, making a holding of 525,659.

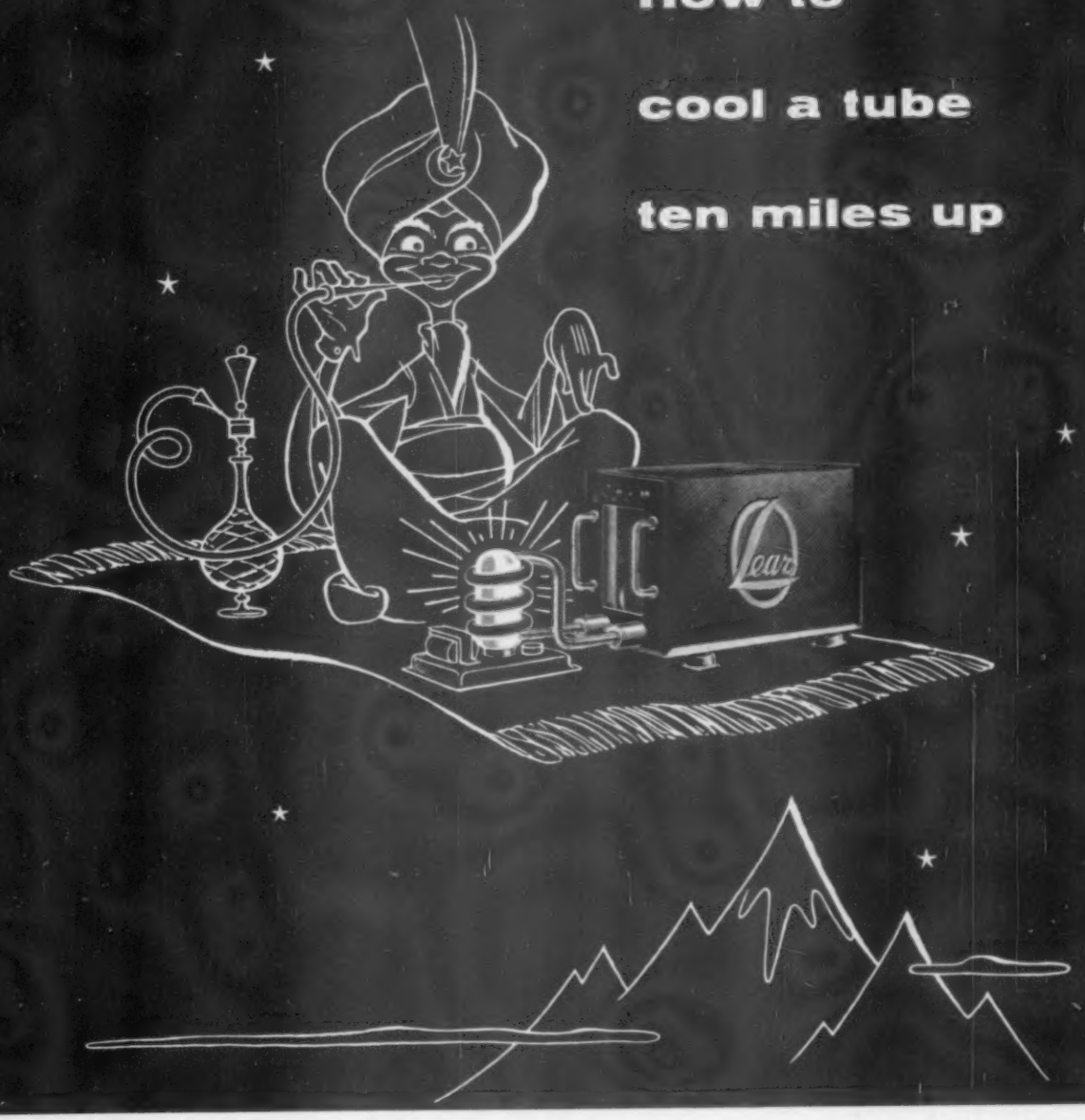
• **Piper Aircraft Corp.** Disposal of 2,500 shares of 45¢ preferred by Norman J. Green, director, his total holding; acquisition of 200 common shares by R. K. Griffin, director, making a holding of 300; acquisition of 500 common shares by Howard Piper, officer and director, making a direct holding of 800 and an indirect holding of 31,400; disposal of 500 preferred shares by Walter C. Jamouneau, officer and director, leaving no holding; disposal of 1,000 preferred shares by W. T. Piper, officer and director, leaving a holding of 8,320.

• **Radio Corp. of America.** Disposal of 15,000 common shares by David Sarnoff, director, leaving a holding of 15,000.

• **Republic Aviation Corp.** Acquisition of 100 common shares by F. G. Coburn, director, making a holding of 366.

• **Rohr Aircraft Corp.** Acquisition of 500 common shares by A. F. Kitchin, officer, making a holding of 1,385; acquisition of 400 common shares by B. F. Raynes, officer, making a holding of 1,900.

How to cool a tube ten miles up



Why do you *have* to cool an electron tube at altitudes where air temperatures hover near 65° below?

Well, take, for example, the high-input tubes in certain critically important equipment built by the W. L. Maxson Co. for our first-line strategic bombers. In a matter of seconds, these tubes can get really hot—hot enough to melt! Stratospheric air, cold as it may be, is just too thin to dissipate so much heat so fast.

Maxson has solved this problem with compact, lightweight, Lear-Romec *liquid*-coolant systems, specially designed to keep the tubes at safe temperatures.

At 50,000 ft. these efficient Lear-Romec cooling packages dissipate up to ⅓ more heat than other available equipment. We'll be delighted to prove this, upon request, by sending you complete test reports via return air mail.

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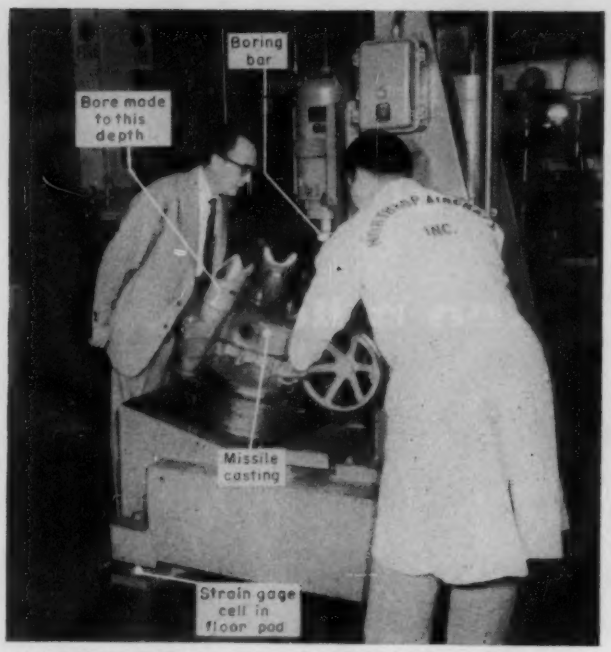
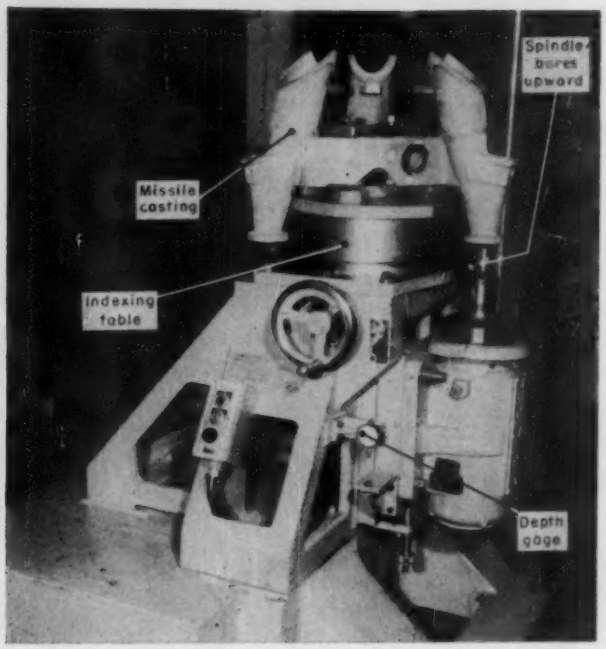


MULTI-TOOL BORER cuts four diameters in sequence. Four tools are mounted in single boring bar. Finish obtained is 63 micro-inches r.m.s. within i.d. tolerance of .0009 in.



ALIGNMENT HOLES in Northrop SM-62 Snark missile casting are bored, counterbored and chamfered in this reverse-vertical borer built to Northrop's specifications by Cleveland Universal Jig Co.

Northrop Machines Snark Missile Castings to Superfine Tolerances

By Irving Stone

Hawthorne, Calif.—First details of production techniques used on the SM-62 Snark missile reveal the extremely close tolerances to which Northrop Aircraft is working on the "bird."

The five special heavy duty tools developed by Northrop to machine Snark castings produce angles to tolerances between 5 and 10 sec. of arc. Hand-lapping brings this down as low as 1 sec. The machines are so precise, special optical fixtures had to be created to check the parts processed on the tools.

Set-up on the machines is a painstaking procedure. A built-in 40 power microscope checks calibration on indexing equipment to insure precise setting of part and fixture before the run begins. Northrop says the careful machining before hand-lapping saves many hours of skilled labor.

The cast Mechanite base of each machine was lapped while mounted on Baldwin-Lima strain gages. As the gages are integral with the equipment's floor pads, a machine may easily be releveled in case of earth tremor or other disturbance which might change tool alignment or bearing force.

Slow feeds combined with high speeds and light cuts produce near-mirror finishes.

Reverse-Vertical Borer

Alignment holes in the Snark casting are bored, counterbored and chamfered in an "upside-down" boring setup. A Pope motorized precision spindle, working upward, insures accuracy of the bore, feeding in at only .008 in. with each revolution of the hand-feed control wheel. A depth indicator on machine has a .0001-in. dial.

This machine, like the others, has a Cleveland Universal Jig Co. indexing table with 40-power scope added by Northrop.

The tool was built to Northrop design specs by Special Tools & Machine Co., Los Angeles.

Multi-Tool Borer

A specially designed boring bar is a feature of this machine. Four DeVleig Microbore tools, working vertically downward, are carried in the bar in sequence to obtain a 63-micro-inch rms. finish on the four diameters of the bore. The machine holds an inside-diameter tolerance of plus .0009 in., minus zero.

The three-location 120-deg. stops on the indexing table are accurate within plus or minus 5 sec. of arc.

A hand feed advances the tool .025 in. in each revolution of the control wheel.

The machine was built for Northrop by Mechanical Specialities Co., Los Angeles.

Miller and Borer

Precision angle boring is accomplished on a combination boring and milling machine. Four motorized Pope heads perform boring, counter-boring and milling in sequence at different angles. The boring tools develop a finish of about 32 micro-inches rms. at 3,600 rpm. with a solid Carboloy drill.

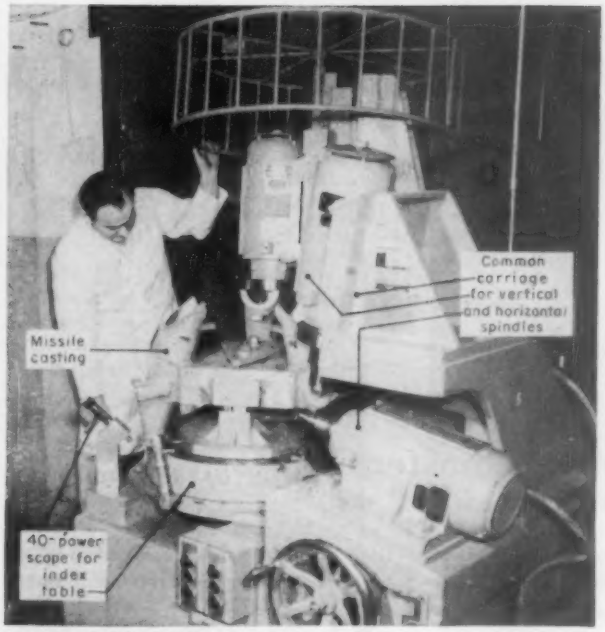
Spindle angles are held to a maximum tolerance of plus or minus 1 min. of arc.

One vertical and one horizontal head on a common carriage do milling only. The other two accomplish boring and counterboring.

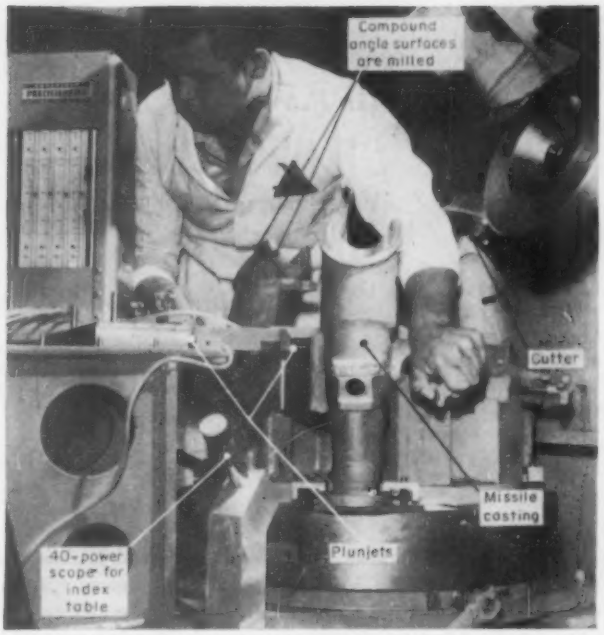
Falco Machine & Tool Co., Los Angeles, built the machine to Northrop's design and specs.

Compound Angle Mill

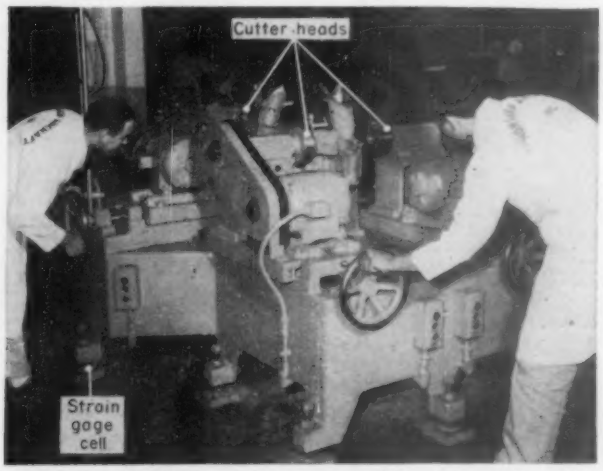
Two compound angles are milled on this machine tool. Pope spindles, each driven by a three-belt system and a 3-hp. Master Electric Co. motor, are fitted with DeVleig cutter heads. A console is used to operate both the



COMBINATION BORER and miller does job in rapid sequence. The boring tools give surface finish of about 32 micro-inches r.m.s. The angular tolerance is held to 1 min. of arc.



THIS COMPOUND ANGLE MILL machines in sequence two tube-end surfaces having different slopes. The hardened ways of the machine are lapped to within 5 seconds of arc accuracy.



HORIZONTAL MILL machines two parallel surfaces and another opposed at 90 degrees in sequence with Pope belt-driven spindles.

OPTICAL CHECK STAND for the inspection of Snark machined casting which uses as many as seven collimators.

cutter heads and the crossfeed, which is powered by a Boston Gear Co. ratio motor.

Set-up alignment is accomplished with a Sheffield Precisionaire gage with Plunjets and optical collimators set for 10 sec. of arc accuracy. Hardened ways of the machine are lapped to an accuracy of within 5 sec of arc. Special Tools & Machine Co. also built this machine for Northrop.

Horizontal Mill

Two parallel surfaces and another opposed at 90 deg. are machined in this horizontal mill. Machining is done in sequence, using Pope belt-driven spindles. DeVleig heads use Carboloy cutters.

The hardened ways of machine also have been lapped to within an accuracy of 5 sec. of arc.

Falco also constructed this horizontal mill especially to Northrop's specifications.

Inspection

Ordinary methods of checking the rigid tolerances involved in the machining process could not be used, hence Northrop tooling and quality control engineers have designed optical inspection devices which use as many as seven collimators for gaging some of the parts to tolerances as low as 1 sec. of arc.

These were built by Opto Engineering Co., Los Angeles.

Fiber-Foil Blanket Insulates Tail Pipes

Stainless steel foil encloses ceramic fiber in insulating blankets being made for hot tail pipes on B-47s, F-100s and F-86s. The blanket filler is Carborundum Co.'s Fiberfrax, an aluminum silicate fiber which has a melting point of over 3,000F (AW Aug. 25, 1952, p. 30).

The Fibertrax comes in bulk to John J. Foster Co. of Santa Ana, Calif. Foster then forms it to desired densities on its specially-designed equipment (photo next page). Processed to batt form, the Fiberfrax is assembled with the stainless steel foil (although In-

Biggest Air Force transport

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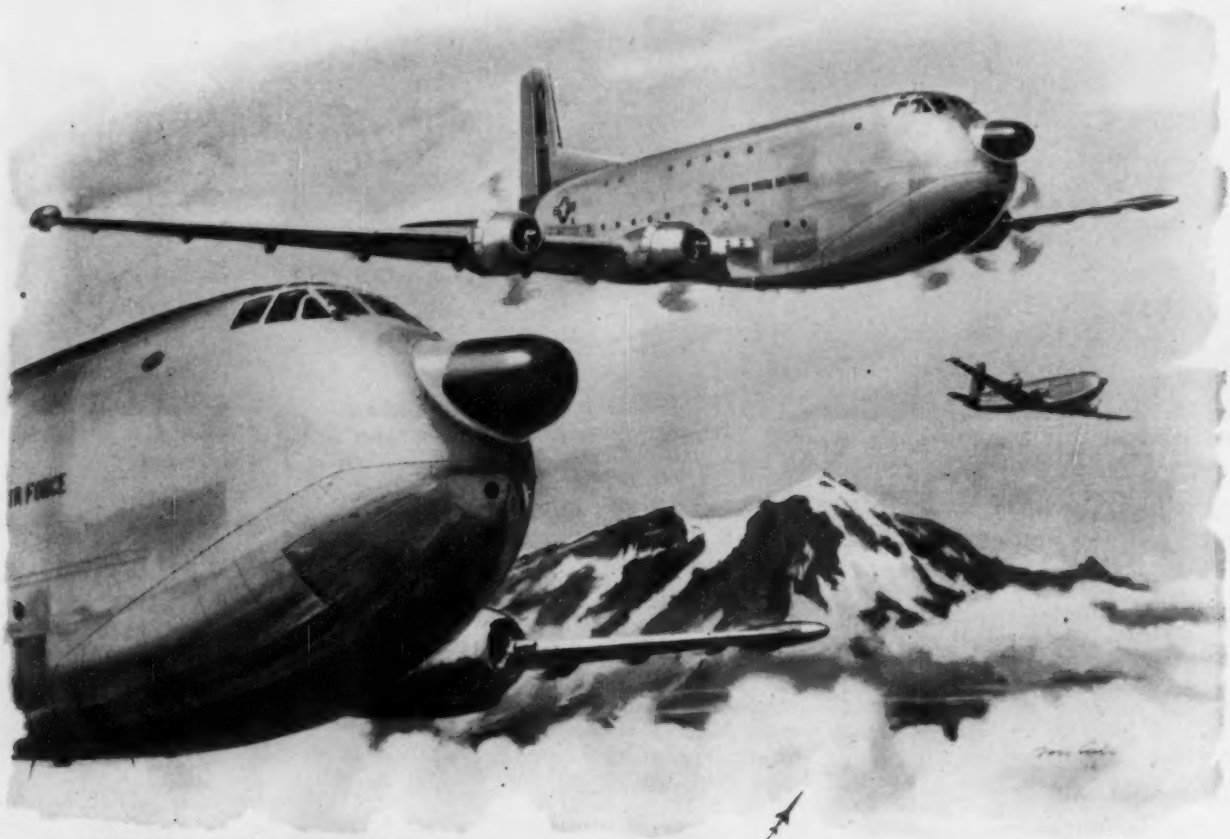
Now entering its fifth year of service to the nation, the Douglas Globemaster has proved its worth in all climates, all types of transport operation.

Combining speed and range with the stability needed for operation under all weather conditions and from varied ground facilities, Globemaster can stow 25 tons of cargo or accommodate 200 fully armed troops. Most important, its capacious interior can accept 98% of all military equipment without disassembly —even big cranes and ready-to-fly helicopters. On *performance*, the Douglas Globemaster is known in all theaters of operation as our most versatile military cargo-transport plane.

Performance of Globemaster under all conditions indicates Douglas aviation leadership. Versatility of operation is a basic rule of Douglas design.



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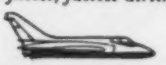
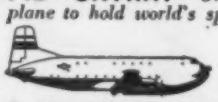


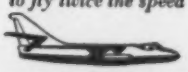
F4D "SKYRAY" *Only carrier plane to hold world's speed record*



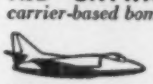
C-124 "GLOBEMASTER" *World's largest production transport*

NIKE *Supersonic missile selected to protect our cities*

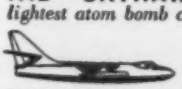
"SKYROCKET" *First airplane to fly twice the speed of sound*



A3D "SKYWARRIOR" *Largest carrier-based bomber*



A4D "SKYHAWK" *Smallest, lightest atom bomb carrier*



B-66 *Speedy, versatile jet bomber*

With its airplanes bracketing the field from the largest personnel and cargo transports to the smallest combat types, and a broad variety of missiles, Douglas offers the engineer and scientist unequalled job security, and the greatest opportunity for advancement.

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FIBER INSULATING BLANKET of steel-sheathed Fiberfrax is laid out by worker.

conel or other high-temperature and corrosion-resistant metals may be used) in sections on a jig. When completed, the blanket fits around the entire length of the jet tail pipe.

The most commonly used blanket design made by Foster has a metal casing with intermittent creases on the interior side. The foil is flat on the outside and is welded at the edges to keep out fuels and fluids. A Monel metal screen supports strips and attachments for lacing the blanket to the tail pipe assembly, helps keep the blanket to design thickness and protects its outer surface against abrasion.

PRODUCTION BRIEFING

► **Carrier Corp.**'s Spectrol Electronics Division, San Gabriel, Calif., plans to expand plant facilities, increasing production by about 300%.

► **Temco Aircraft Corp.**, Dallas, has been awarded a new Air Force contract for production of F-100 armament and fuel pylon assemblies. Temco also will fabricate titanium-alloy parts for F-100.

► **Benchmaster Manufacturing Co.**, Gardena, Calif., has organized a division to engineer and custom-develop special machines to fit the needs of manufacturers now using "compromise" tools on unusual jobs.

► **Plastic-capped Kirksite drop hammer dies**, suitable for forming duct halves, beads, angles, channels and shallow pan sections, have been developed by the plastics group of Republic Aviation's Manufacturing Research and Development Department. The die face is composed of rigid epoxy resin compound containing wear-resistant filler such as aluminum oxide. Liquid polymers are supplied by Thiokol Chemical Corp., Trenton, N. J.

► **Inductotherm Corp.** has moved from Glenolden, Pa., to a larger plant at 412 Illinois Ave., Delanco, N. J. Move was made in order to consolidate high-frequency heating and melting equipment operations.

► **Columbia-Southern Chemical Corp.**, Pittsburgh, and Imperial Chemical Industries Ltd., London, England, have submitted a joint application to the U.S. government for a contract under which the government would purchase 5,000 short tons per annum of granular titanium metal over a five-year period.

► **Rohm & Haas Co.** has completed a 14,500-sq. ft. plastics research and development laboratory at Bristol, Pa. The structure will house engineering offices, design studio for customer service and a chemical laboratory.

► **Minneapolis-Honeywell Regulator Co., Ltd.**, has established an independent Aeronautical Division at Toronto.

► **Reichhold Chemicals, Inc.** will open a new plant in Kansas City, Kan., concentrating on production of Plyophen Liquid and powdered phenolic resins. Plans include the installation of a formaldehyde plant and the manufacture of full line of chemicals and resins. Plant will be managed by L. C. Brandt with Dr. A. L. Wooten as technical director.

► **Longest door frontage** yet installed at New York International Airport will be erected in September for the Port of New York Authority. Twelve motor-operated sliding doors manufactured by International Steel Co., Evansville, Ind., will be located on either side of the more-than-450-ft.-long hangar. They are 32 ft. high; total width will be 922 ft.

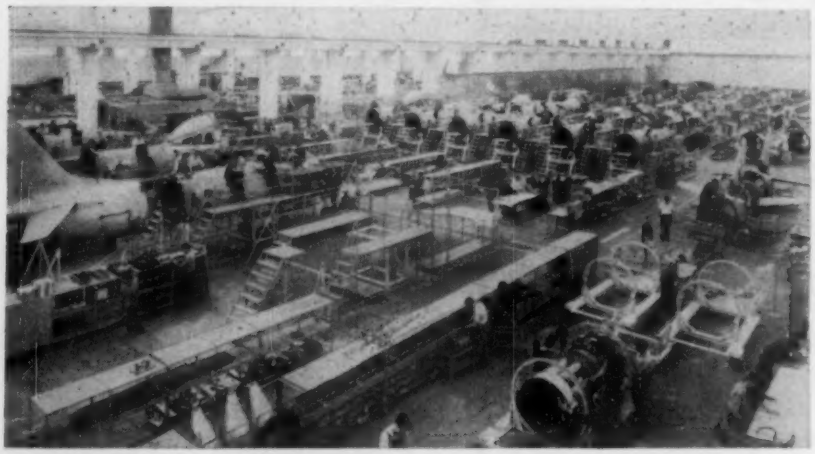
► **Nelmor Manufacturing Corp.**, Euclid, Ohio, developer of a vacuum die-casting process has licensed Sparklets, Ltd., Division of British Oxygen Co., to set up a pilot plant. The process removes entrapped gas and air from casting, reducing internal porosity while skin hardness, thickness, tensile strength and surface finish are improved.

► **C. W. Marwedel Corp.**, San Francisco, has become a subsidiary of the Garrett Corp. The acquired firm will continue to operate under its present name, serving the San Francisco area with tools, metal and industrial supplies. Ralph V. Vincent will retain his position as general manager, and E. F. Marwedel, former president, will remain as a member of the board of directors.

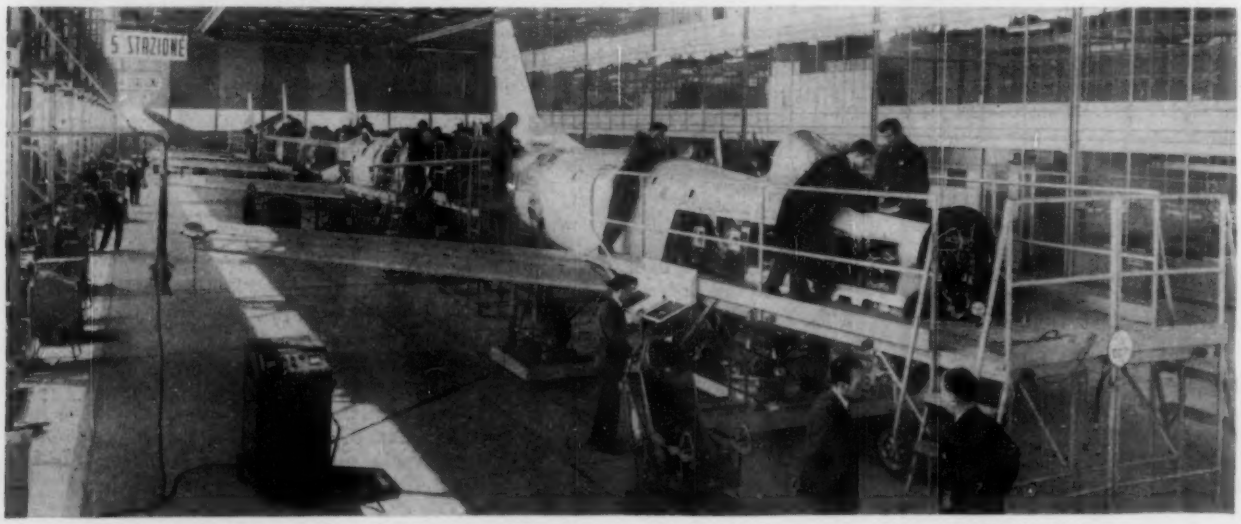
FIRST FIAT-PRODUCED F-86K is surrounded by sister ships during delivery ceremony at Turin. The F-86K is NATO version of North American's F-86D, with classified radar removed and rocket armament replaced by four 20-mm. cannon. Fiat has orders for 180 F-86Ks.

Fiat Pushes NATO F-86K Production

The first of 180 F-86Ks Fiat is building has been delivered to USAF for assignment to the Italian air force, which is slated to get 126 of the Sabres. The remainder are scheduled to go to Holland. The Italian licensee also has been chosen to overhaul other F-86s now flying with Western air forces in Europe, and has started on the first lot of 72.



OVERALL VIEW OF FACTORY FLOOR shows planes in various stages of assembly.



SABRE NEARS COMPLETION at Fiat's Caselle plant. The planes are slated for delivery to the Italian and Dutch air forces.

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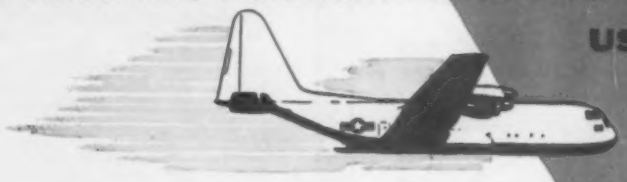

ON WATCH in the compartments housing the four Allison turbo-prop engines and the gas turbine compressor, FIREYE* will respond with the speed of light at the first flicker of flame. Its *instantaneous* action assures maximum protection for the troops or cargo in the freight car size "hold" of this great turbo-prop combat transport. For complete information write . . .

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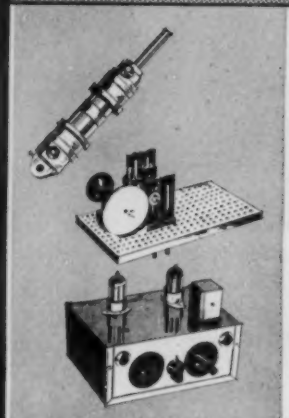

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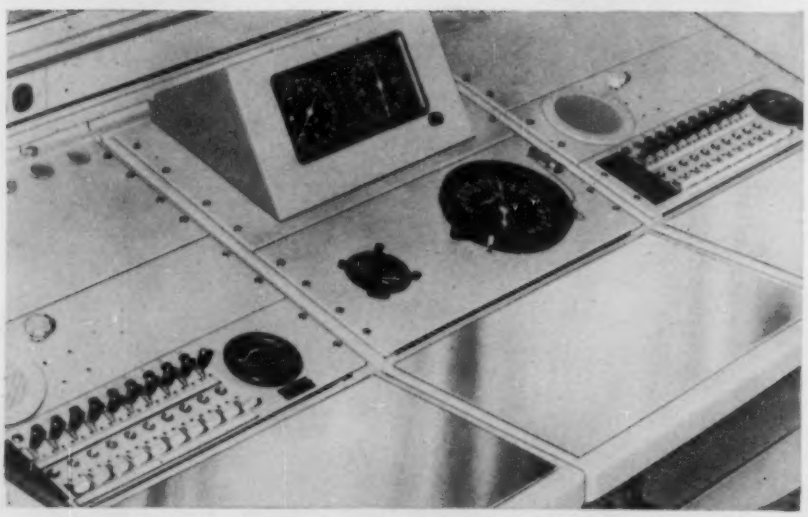
FUNCTIONAL DESIGN



Shown above is the ACC-10B Console, installed in a Wickes T-4 *Portable* Airport Control Tower. Designed for maximum operating convenience, the ACC-10B is based on the "building block" approach to console design. Such advanced design offers a completely unitized, *functional* system which can be expanded and adapted to meet any operating condition.

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USAF Contracts

Following is a list of recent contracts announced by the United States Air Force:

United Aircraft Corp., Sikorsky Aircraft Div., Crane Bldg., South Ave., Bridgeport, Conn., H-37 mobile training units, 1 set, (IFB MIPR R-55-528-AVD-RP), $428,988.

Chicago Aerial Industries, Inc., 1980 Hawthorne Ave., Melrose Park, Ill., test equpiment, (IFB MIPR R55-923-38-Aer, MIPR R54-4985-199-Aer), $101,528; converter, image velocity signal, 127, ea., detector, image velocity, 127 ea., (IFB PR 570056-2), $143,412.

Continental Motors Corp., Muskegon, Mich., engines, O-470-11, 159 ea., maintenance and engineering data, (IFB MIPR R55-5679- TCAFS-MDAP, R55-5646-TCAFS-MDAP, R-55-531-AVD-RP), $524,079.

Kingston Products Corp., 1412 N. Webster St., Kokomo, Ind., radio set, AN/CRT-3A and data, (IFB MIPR R55-2564-8-Aer, R55-2632-85-Aer), $71,897.

Standard Coil Products Corp., Kollsman Instrument Corp., Div., 80-08 45th Ave., Elmhurst, N. Y., indicators, airspeed and Mach number, 325 ea., (IFB PR PE-159347 and PE-204045), $105,564.

Curtiss-Wright Corp., Wright Aeronautical Div., Wood-Ridge, N. J., engines, turbojet J65-W-5, (IFB PR PE-159255), $8,359,956.

Motorola, Inc., 2710 North Claybourn Ave., Chicago 14, indicator, spare parts, and data, (IFB PR 427586, 421057), $3,308,455.

Librascope, Inc., 808 Western Ave., Glendale, Calif., computer set, navigational, AN/ASN-9, spare parts, data and engineering services, (IFB PR-PE-168032), $142,628.

Gordon Enterprises, 5362 N. Cahenga Blvd., North Hollywood, Calif., camera gun, AN-N6-A, 250 ea., camera, gun, AN-N6, 200 ea., (IFB MIPR, R55-166-2381-ASO-SCG6), $83,190.

Radioplane Co., 8000 Woodley Ave., Van Nuys, Calif., spare components of the C-2 remote flight control system, (IFB MIPR R-55-16-ORDJR-ORP, R-55-17-ORDJR-ORP), $1,272,148.

Edo Corp., 13-10 111th St., College Pont, N. Y., float assemblies, 42 ea., (IFB MIPR R-55-6424-TCAFS), $148,357.

Standard Coil Products Corp., Kollsman Instrument Corp. Div., 80-08 45th Ave., Elmhurst, N. Y., computers, airspeed and Mach number, 142 ea., (IFB PR PE 204034), $251,268.

Wollensak Optical Co., 850 Hudson Ave., Rochester 21, N. Y., lens, LE-2, 375 ea., (IFB MIPR R55-2069-SC-SMD-24), $34,631.

Bell and Howell Co., 7100 McCormick Road, Chicago, projector sets, domestic, 690 ea., projector sets, export, 854 ea., projector equipment, 16-mm., 1,009 ea., (IFB MIPR R-02-590020-SC-01-23, PR MO-450061), $1,618,739.

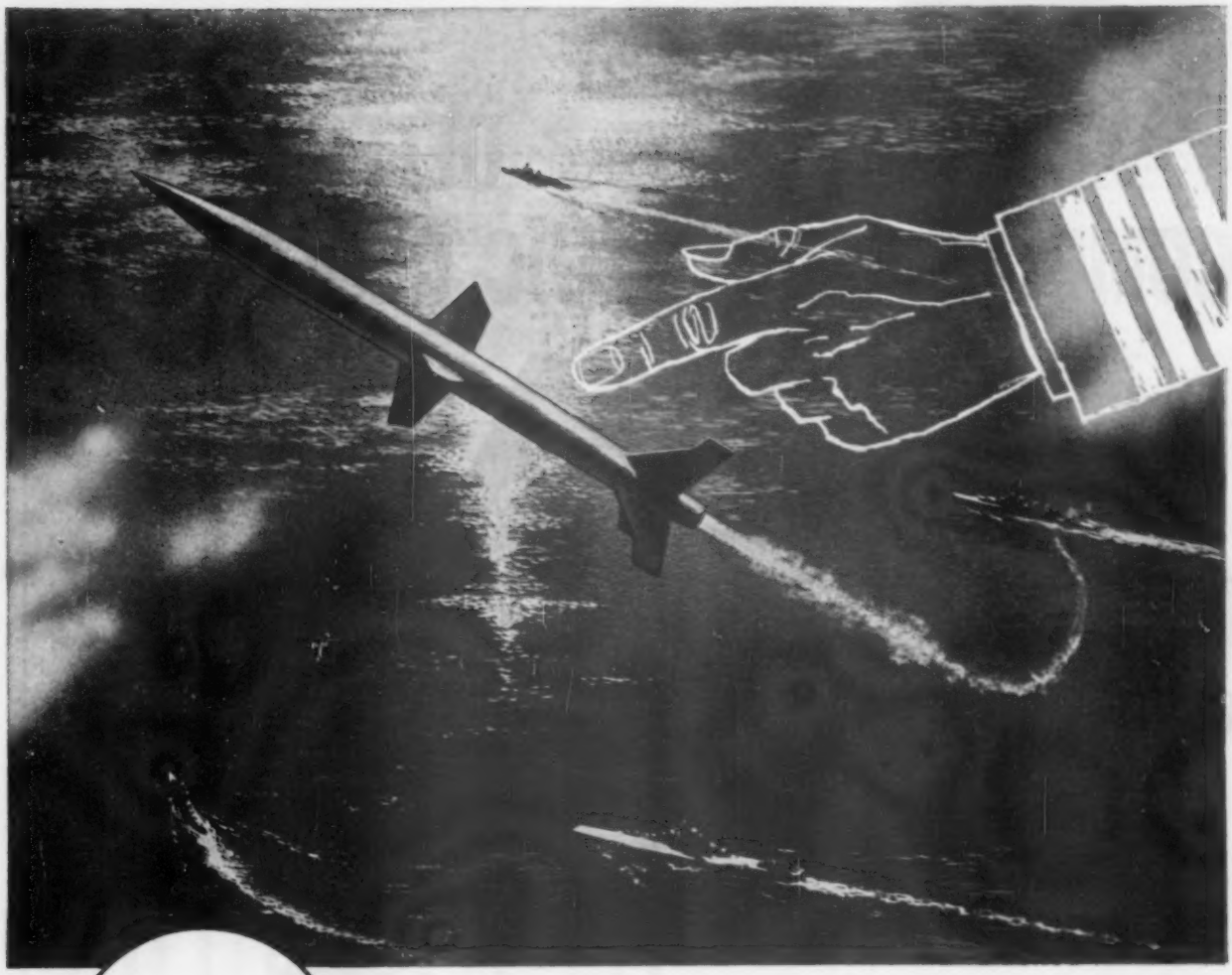
Aeroflex Laboratories, Inc., 34-06 Stillman Ave., Long Island City, N. Y., items of replacement spare parts for torquer mount system, 28 ea., (IFB MIPR R55-281-2512-ASO-SCG-6 and PR MO-570079), $71,240.

American Automatic Typewriter Co., 2323 N. Pulaski Road, Chicago, photographic film dryer, 40 ea., (IFB MIPR R55-187-2400-ASO-SCG6), $49,892.

General Tire and Rubber Co., 1708 Englewood Ave., Akron, wheel assys. for T-33A aircraft, 179 ea., wheel assys. for F-86F aircraft, 426 ea., (IFB PR 203324 and 497712), $46,710.

Westinghouse Electric Corp., 32 N. Main St., Dayton, indicator, pitch trim, PN 1JB84401, 97 ea.; coupler, compass, PN 1JC309G3, 46 ea., controller, flight, P/N 1JD385G3, 33 ea., control, angular rate, P/—1JD405G4, 17 ea., actuator, hydraulic, P/N LJC380G3, 14 ea., (IFB PR MA-457589), $186,440.

Northrop Aircraft, Inc., Hawthorne, Calif., F-89H mobile training units, 2 ea., E-6 fire control system trainers, 3 ea., (IFB PR



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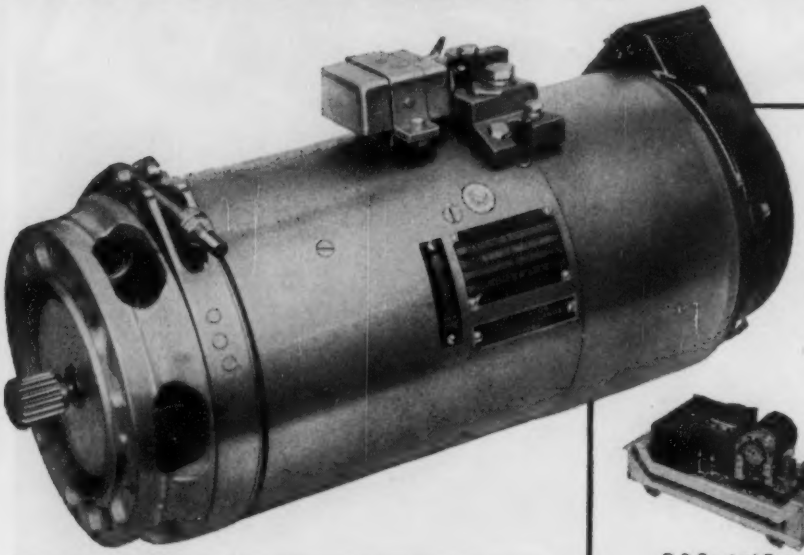
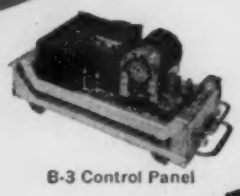


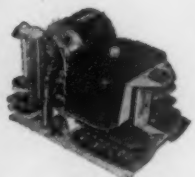
AIRCRAFT-ENGINE-DRIVEN DC GENERATORS FOR 30 VOLT SYSTEMS

Type No.	Nominal Rating			Approx. Weight Lbs.	Designed to Gov't Spec.
	Amps.	Speed Range RPM	Altitude Ft		
30E01	50	2200-4500	20,000	24	M-2, M-3
1345	50	4000-8500	30,000	14.25	
30E22	50	4000-8500	30,000	16.25	
30E14	75	4000-8000	25,000	24.5	N75-2RA
30E16	100	2500-4500	50,000	40	5286588
30E20	150	4000-8000	65,000	45	
30E17	200	2870-8600	Ground Power	40	
30E07	200	3000-8000	50,000	45	AN-3632
30E18	200	4000-8000	50,000	38	MS-25009
30E19	250-350	1600-7500	Ground Power	98	
30E02	300	3450-8500	25,000	64	
30E15	300	4000-8000	50,000	50	AN-3623
30E05	400	3000-8000	50,000	68	AN-3634
30E10	400	3100-8000	60,000	67	AN-3624
30E11	500	4000-8000	50,000	75	
30E13	500	3500-8000	50.000	86	

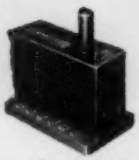
PLUS THIS PROTECTIVE AND CONTROL EQUIPMENT FOR DC SYSTEMS



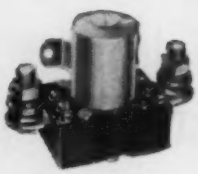
B-3 Control Panel



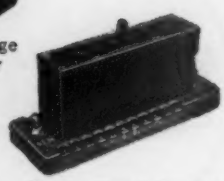
Generator Control Panel



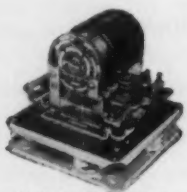
Overvoltage Protector



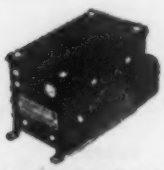
Line Relay



Feeder Circuit Breaker



Voltage Regulator



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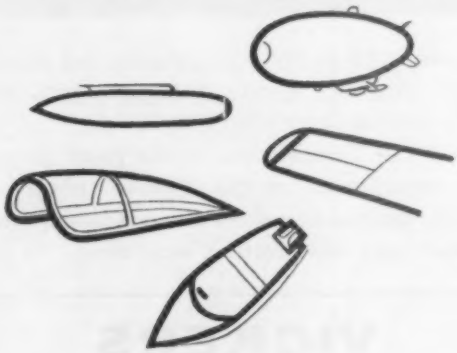

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As a valued member of the nation's air team, Goodyear Aircraft is delivering vital components to virtually every manufacturer in the industry—electronic equipment, guidance for missiles, booster cases, radar structures, airframe members, cockpit canopies, reinforced structural plastic products for many industries—and is the prime contractor of airships.

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MR. J. H. CARMICHAEL, *President of Capital Airlines,* says: "The Vickers Viscount will mean better operating economy and it will appeal to passengers by offering increased flying comfort. It is flexible enough to operate our long-haul and short-haul routes, and attractive enough to take passengers away from our long-haul competitors. No other existing transport plane meets these specifications, but the Viscount meets both tests."

Wherever the Viscount flies . . . traffic figures rise!

Proof of this statement is again to be demonstrated on Capital Airlines Washington-Chicago route. Capital's purchase of 60 Viscounts is soundly based on the proved superiority of the world's first turbo-prop airliner—in terms of passenger preference, speed, economy and profit.

Here are some of the achievements reported by leading airlines as a direct result of putting Viscounts into service: Trans-Canada Airlines—an increase of 32.6% in passengers carried in the first 3 months; British European Airways—an annual profit of $100,000 per Viscount; Trans-Australia Airlines—an increase in load factor with a consistently high utilization which has been as great as 13½ hours per Viscount per day.

Such brilliant records speak for themselves. And they speak well for Capital's astuteness and enterprise in introducing the world's first turbo-prop service between cities in the United States.

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PA177820 and PA177815), $1,039,733.

Fairchild Engine & Airplane Corp., Hagerstown, Md., modification of C-123B-1 mobile training unit components, heater system trainer for C-123B mobile training unit, (IFB PR PH-221769, PH-221783, PA-221781), $277,615.

Continental Motors Corp., Muskegon, Mich., winterization kits for PE 150-2 Packette engines, 570 ea., (IEB PR 154-380), $57,176.

Burton Mfg. Co., Los Angeles, Machmeter, 169 ea., spare parts, (IFB PR 235804 and 673556), $26,789.

Radio Corp. of America, Engineering Products Div., Camden 2, N .J., adapters, headset microphone MX-1656()/AIC, spare parts and data, (IFB PR GE-557623), $207,348.

Rheem Mfg. Co., Richmond & Norris Sts., Philadelphia, trainer, fixed aerial gunnery, 8 ea., special tools, test & ground handling equipment, maintenance spare parts, (IFB PR PA-225761), $3,912,927.

Kearfott Co., Inc., 1150 McBride Ave., Little Falls, N. J., indicator, master component of compass system, 351 ea., (IFB PR 203295, 457489, 597811, 203392 and 597473), $700,656.

Ford Motor Co., 3000 Schaefer Road, Dearborn, Mich., turbojet engine, J57-F-13, 135 ea., turbojet engine, J57-F-13, less afterburner assembly, 8 ea., (IFB PR 159274), $25,702,445.

Central Commercial Co., 332 Michigan Ave., Chicago, components of AN/ARA-19, (IFB PR 580049, 580106), $119,337.

Lear, Inc., 110 Ionia Ave., N.W., Grand Rapids, Mich., automatic pilot systems, MB-2, spare parts, data, (IFB PR 457653), $2,042,518.

Hotpoint Co. Div., General Electric Co., 5600 W. Taylor St., Chicago, turbo-superchargers, model 7SBH1 (setting 5), 105 ea., turbo-superchargers, model 7SBH1 (setting 6), 105 ea., (IFB PR OC-419731), $495,600.

Stromberg-Carlson Co., 100 Carlson Road, Rochester 3, N. Y., components of AN/APN-69, spare parts and data, (IFB PR PE-158670 and GE-142650), $2,513,259.

United Aircraft Corp., Sikorsky Aircraft Div., Crane Bldg., South Ave., Bridgeport, Conn., helicopters, H-34, 43 ea., spare parts for overhaul, 1 lot, spare parts for field and organization support, 1 lot, special tools and ground handling equipment, 1 lot, technical data, 1 lot, (IFB MIPR R-55-501-AVD-RP, PR PH-207384), $16,065,616.

Adache and Case, Engineers, The Arcade, Cleveland 14, architectural engineering services, (IFB PR 219989), $66,086.

Continental Aviation and Engineering Corp., 12700 Kercheval Ave., Detroit, engines, J69-T-9, 40 ea., special tools, maintenance data, (IFB MIPR R55-518-AVD-RP), $1,127,288.

Loucks and Noring Studios, Inc., 245 W. 55th St., New York 19, production of motion picture, project 19184, 1 ea., specification changes, (IFB PR 178795 and RFP 33-600-55-5278), $74,221.

Graflex, Inc., 154 Clarissa St., Rochester 8, N. Y., camera, Speed Graphic, 96 ea., camera, identification, 19 ea., camera, view, 18 ea., (IFB MIPR R55-182-2397-ASO-SCG6), $57,362.

Sperry Gyroscope Co., Great Neck, L. I., N. Y., stabilizer assembly, A-1A bombing navigational computer, 259 ea., transmitter, true heading, A-1A bombing navigational computer, 396 ea., (IFB PR 437634), $2,258,904.

General Motors Corp., A. C. Spark Plug Div., Flint 2, Mich., amplifier, stabilization, A-1A BNC, 351 ea., control, navigational, A-1A BNC, 140 ea., synchronizer, radar, A-1A BNC, 363 ea., (IFB PR 437634), $3,261,669.

Sperry Gyroscope Co., Great Neck, Long Island, N. Y., control, roll and pitch, type K-6A, 87 ea., spare parts, special tools and engineering and handbook data, (IFB PR PE-177951), $108,023.

Curtiss-Wright Corp., Wright Aeronautical Div., Wood-Ridge, N. J., turbojet engines, J65-W-6, and related equipment, (IFB MIPR R-55-2764-145-Aer, R55-762-172-Aer, R55-2768-177, R55-2770-184-Aer), $32,541,952.

Dennison Engineering Co., Columbus 16, Ohio, facilities for manufacture of aeronau-

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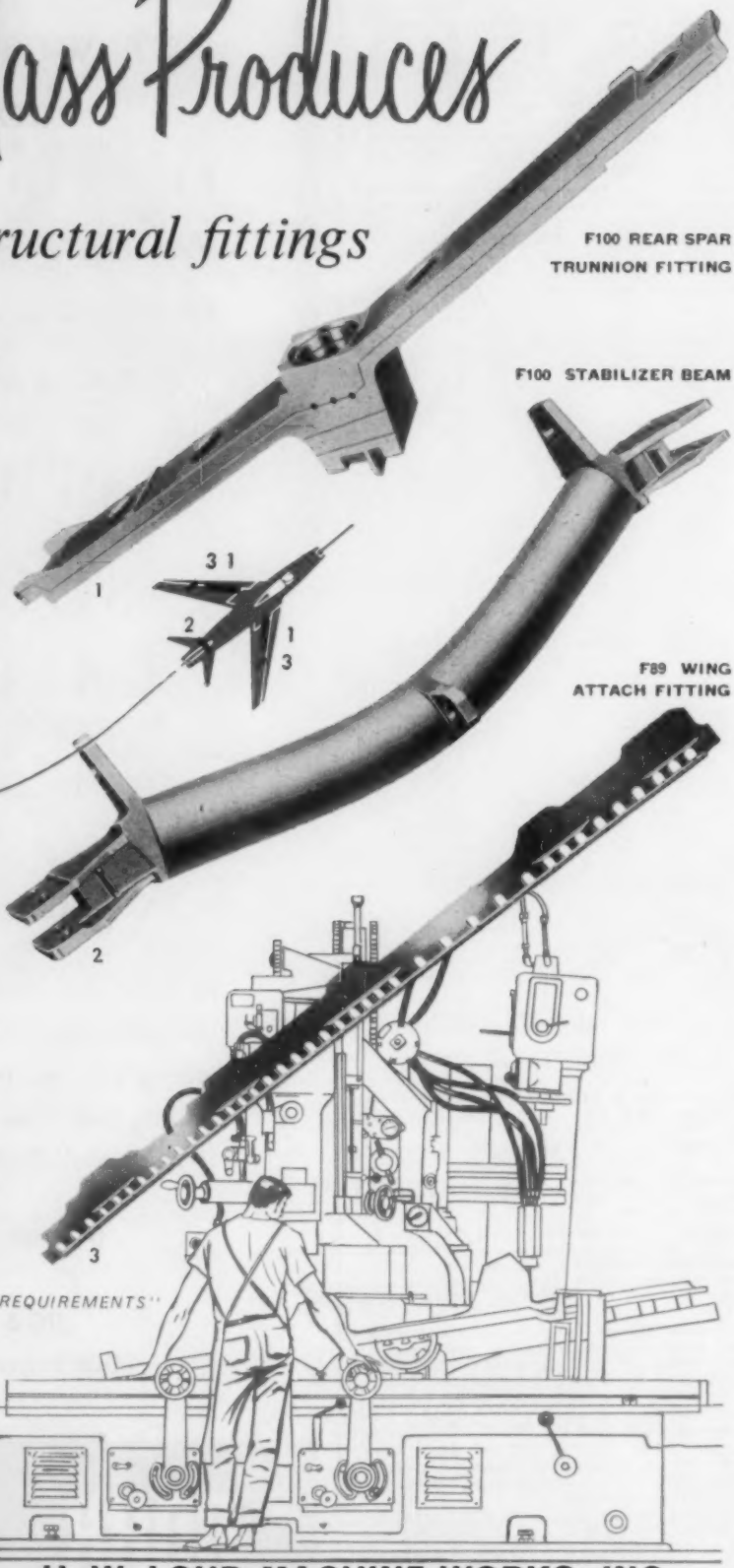
Loud is producing these difficult structural fittings in mass production at the same time maintaining a high degree of quality.

CASE HISTORIES

Today's airplane is being built out of large forgings rather than fabricated sections. The rear spar fitting which combines landing gear trunnion support and wing spar into one single forged and machined fitting is representative of planes of tomorrow. This fitting is over 8 feet long and is machined on one of Loud's ten 28″ × 120″ Cincinnati Hydrotels. Advance in designs create more complicated machine operations.

The maximum utilization of facilities is illustrated in the flashwelding of the stabilizer beam. The strength, weight saving qualities, and savings of considerable cost in flashweld-designed structural fittings are a necessity in present day aircraft construction.

It would be impossible to manufacture such complex fittings as the stabilizer beam without utilizing such modern equipment as the 800 KVA flashwelder combined with large milling equipment and complete heat treating facilities. The 10 foot extruded aluminum wing attach fitting is another example of complicated milling, broaching and contouring produced on Loud's outstanding equipment.



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tical hydraulic pumps, (IFB PR 148875), $78,000.

General Electric Co., Johnson City, N. Y., fire control system, A-5, spare components and spare parts for B-47 aircraft, (IFB PR 401981), $314,672.

Kollsman Instrument Corp., 80-08 45th Ave., Elmhurst, N. Y., altimeter, pressure station (type MS24134-1 and 2), 274 ea., (IFB PR 597512), $46,242.

Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark, N. J., indicator, ID-351A/ARN., (IFB PR 457587, MIPR R55-2648-115-Aer), $881,403.

General Electric Co., 1 River Rd., Schenectady, N. Y., tachometer indicator, type E-34 Aerno 61-223, (IFB PR 203225), $36,-705.

C. T. M. Co., Inc., 10 Howard St., Buffalo 6, N. Y., rack, bomb, electrically operated, type S-4, 134 ea., (IFB PR 427881), $35,236.

Oscar Fisher Co., Inc., 1000 N. Division St., Peekskill, N. Y., photo chemical mixing tanks, 10 gallon, 79 ea., 20 gallon, 8 ea., 30 gallon, 55 ea., 50 gallon, 62 ea., (IFB PR MO-600005), $37,526.

Cook Electric Co., 2700 Southport Ave., Chicago, control assemblies, inverter changeover, type A2, 663 ea., (IFB PR SA-560160), $26,818.

Bond Research Laboratories, Inc., 84 Winslow Ave., Somerville, Mass., launchers, meteorological balloon, trailer mounted, 10 ea., commercial type manuals, 10 sets (IFB PR 145426), $81,668.

Bendix Aviation Corp., Eclipse-Pioneer Div., 43 Williams Ave., Teterboro, N. J., control, roll and pitch, 134 ea., (IFB PR WR-420890), $130,708.

Sperry Gyroscope Co., Great Neck, Long Island, N. Y., amplifier, electronic control, type MB-4 Aerno 60-1804 (C-130 aircraft), 107 ea., spare parts, (IFB PR 177967), $546,105.

Minneapolis-Honeywell Regulator Co., 2600 Ridgway Road, Minneapolis, components of type E-11 and E-11B autopilot, (IFB PR 177949, 457655, 457666, 597417, 597416), $1,387,520.

Chicago Aerial Industries, Inc., 1980 N. Hawthorne Ave., Melrose Park, Ill., test equipment for Navy camera control components, 15 sets, (IFB MIPR R55-958-148-Aer), $281,429.

Polaris Pictures, Inc., 2859 W. Third St., Los Angeles 36, production of motion picture project SFP 358, (IFB PR 178785, RFP 33-600-55-5272), $31,170.

Bendix Aviation Corp., Red Bank Div., Eatontown, N. J., inverter, 95 ea., (IFB PR SA-545933), $34,519.

Westinghouse Electric Co., 32 N. Main St., Dayton 2, generators, 202 ea., (IFB PR SA-546155), $61,408.

Continental Aviation and Engineering Corp., 12700 Kercheval Ave., Detroit, overhaul of 975-19 engine, 6 ea., cylinders, 4 sets, parts for overhauls, (IFB PR 2211), $30,000.

Riverside Metal Co., Keystone Watch Case Div., Riverside, N. J., landing gear position indicator, type AN 5839-1, (IFB PR 235818), $29,294.

Goodyear Tire and Rubber Co., Inc., Akron, Ohio, brake assemblies, 12.7 x 14, 200 ea., wheel assemblies, 26 x 6.6 60 ea., brake assemblies for 26 x 6.6 wheels, 68 ea., (IFB PR MO-498183), $66,415.

Warner News, Inc., 33 W. 60th St., New York 23, production of motion picture, project SFP 359, 1 ea., specification changes, (IFB PR 236065, RFP 33-600-55-5299), $57,619.

Minneapolis-Honeywell Regulator Co., 2600 Ridway Rd., Minneapolis, tire control couplers, spare parts special tools and test equipment and data, (IFB PR 177975), $2,647,981.

Randall Manufacturing Co., Inc., 801 Edgewater Rd., New York, dryer, EL-4 photographic, 238 ea., (IFB MIPR-RO2-590398-SC-01-23), $63,099.

Continental Motors Corp., 205 Market St., Muskegon, Mich., engines, PC 60-5 for F-6 refuelers, 706 ea., engines, PE 150-6 for MD-3 generator sets, 276 ea., (IFB PR ML 444165, 644576, SM-174348, 174329), $3,534,-684.

General Electric Co., Electronics Department, Syracuse, New York, facilities (machinery and equipment) for the performance of radar maintenance and repair, (IFB

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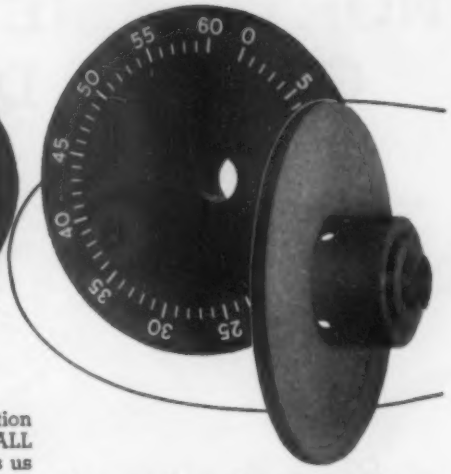

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PR 183786, 204,928, 570376), $129,978.

Continental Aviation and Engineering Corp., 12700 Kercheval Ave., Detroit, production tooling, (IFB PR 673646), $474,118.

General Mills, Inc., Mechanical Div., 1620 Central Ave., Minneapolis, spare parts for Y-4 bombsight, (IFB PR 427884), $100,000.

Eastman Kodak Co., 343 State St., Rochester, N. Y., spare parts used on Y-3 bombsight, (IFB PR 427885), $706,000.

Sperry Gyroscope Co., Great Neck, Long Island, N. Y., flight computer indicator component of A-2, 29 ea., control assys., component of A-2 flight computer, 50 ea., amplifier, sub-assy. of A-2 flight computer system, 72 ea., control, quick erector subassy. of A-2 flight computer, 142 ea., (IFB PR 457750 and 597509), $261,550.

Radio Corporation of America, 11819 West Olympic Boulevard, Los Angeles, components of AN/APN-70, (IFB PR PE-158756, GE-558507), $430,365.

Continental Aviation and Engineering Corp., 12700 Kercheval Ave., Detroit, engines, J69-T-19, 8 ea., (PR 229174), $179,417.

Piasecki Helicopter Corp., 100 Woodlawn Ave., Morton, Pa., spare parts for 90 H-21C helicopters, (IFB MIPR R-55-523-AVID-RP), $8,000,000.

Magnavox Co., 2131 Bueter Road, Fort Wayne, Ind., components of AN/ARN set, (IFB PR GE-557904 and MIPR RO2-SC-01-23,W 28-033-1715-SCHELa-55), $75,148.

Kearfott Co., Inc., 1378 Main Ave., Clifton, N. J., indicators, ID-91B and loop assemblies, AS-313B/ARN-6, (IFB MIPR R-02-590152-SC-01-23, and W28-003-1715-SCELa-55), $64,215.

Bell Aircraft Corp., Helicopter Div., Fort Worth, helicopters, H-13H, 21 ea., spares, special tools, ground handling equipment and data, (IFB MIPR R-55-525-AVD-RP), $443,000.

Convair Div. of General Dynamics Corp., San Diego, Calif., pre-production expenditures for F-102B airplane program, (IFB PH-177841), $5,000,000.

Raytheon Manufacturing Co., 100 River St., Waltham, Mass., transmitting set, countermeasures AN/ALT-8, 400 ea., transmitter group, OA-849/ALT-8, 800 ea., transmitter group, OA-850/ALT-8, 134 ea., (IFB PR 553551, 553553, 5534591, 553440, 553538, 553460, 553547 and 553556), $4,752,180.

Canadian Commercial Corp., Washington, aircraft, L-20A, 31 ea., spare parts, special tools, (IFB MIPR R-55-533-AVD-RP, R-55-535-AVD-RP), $711,534.

Sperry Gyroscope Co., Great Neck, Long Island, N. Y., control, roll and pitch, type K-6A, 13 ea., control, servo single motor, type 0-3, 15 ea., motor and drive assembly, servo, type D-4, 240 ea., motor and drive assembly, type E-1, 349 ea., (IFB PR 157886), $568,307.

Thomas A. Edison, Inc., Ediphone Div., 51 Lakeside Ave., West Orange, N. J., positioning mechanisms, range servo, gun-bomb-rocket sight, type A-3, (IFB PR WR 460028), $46,417.

Aerojet-General Gets Fast Writeoff Grant

Aerojet-General Corp. Sacramento County, Calif., has been granted a $6,525,800 certificate of necessity for research and development facilities by the Office of Defense Mobilization with 70% allowed for rapid tax amortization.

Other certificates recently issued:

Hartford Tool & Die Co., Inc., Bloomfield, Conn., military aircraft engine parts, $17,236 certified with 70% allowed.

Lockheed Aircraft Corp., Burbank, Calif., military aircraft, $527,938 certified with 65% allowed.

Ex-Cell-O Corp., Fostoria, Ohio, military aircraft engine parts, $17,643 certified with 55% allowed.

Stauffer Chemical Co., Westchester County, N. Y., research and development, $288,500 certified with 50% allowed.

J. S. Thorn Co., Philadelphia, Pa., steel landing mats, $537,600 certified with 55% allowed.

new Boeing jet tanker to stretch America's Air Arm with mid-air refueling

Almost daily, continuous flights halfway around the World are being made because huge KC-97 tankers meet bombers for refueling in mid-air. Tankers like the Boeing KC-135 will bring "targets" on faraway Continents within striking distance. The new Boeing KC-135 will haul extra large cargoes because *added strength* with *less weight* is possible with metal honeycomb construction. Kawneer is helping build more planes like the KC-135 *faster* because of excellent metal bonding facilities to produce any kind of honeycomb assembly. Our experience in metal bonding honeycomb will be helpful to you in designing new applications of this material. This is another example of how you can benefit by Kawneer's integrated engineering and manufacturing service.

Kawneer will produce the ailerons for the KC-135 utilizing honeycomb sandwich construction

Illustrated here is the Boeing 707 Tanker-Transport prototype of the new KC-135.

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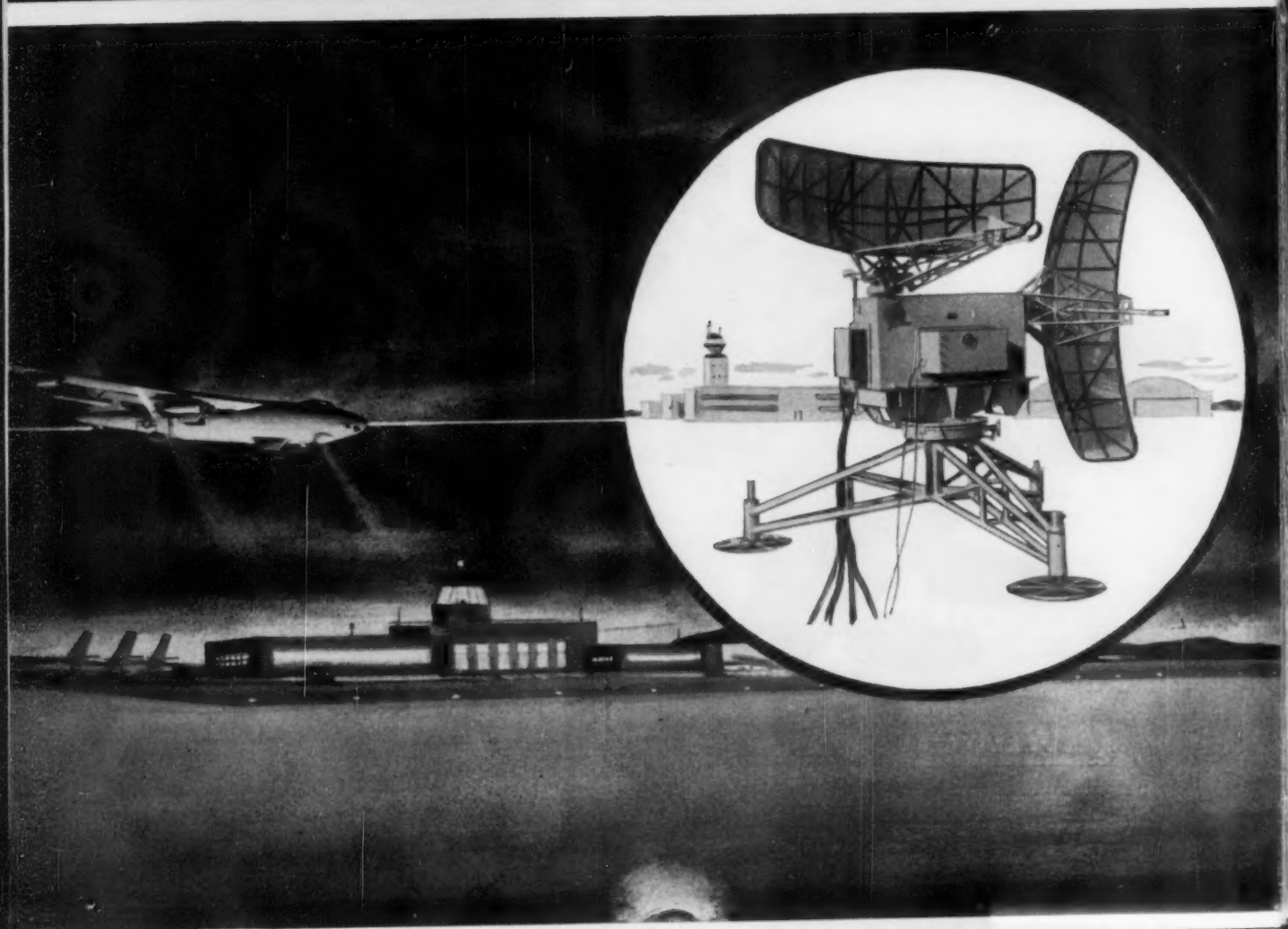

Internationally famous SPAR now has a teammate!

It's STAR—a surveillance radar system designed to guide distant aircraft swiftly and surely into SPAR's radius for a precision approach and landing. Watching the skies together, STAR and SPAR are the ingenious *portable* answer to the growing problems created by the rapidly increasing traffic at all airports. Amazingly light, easy to install and easy to use, STAR and SPAR are comparable if not superior to the more complex, cumbersome and expensive types of radar equipment.

Yet, *their cost is about one-third as much*—thus making them available to both small and large metropolitan airports, as well as to military airstrips all over the globe.

Working as a team, STAR and SPAR reduce to a bare minimum the hazards of heavy traffic and foul weather. But they are also designed and engineered to operate independently. No wonder the Air Force, the Navy, European governments and airport managements are so vitally interested in this revolutionary concept of air safety.

STAR is a surveillance radar system, unerringly accurate in locating and tracking aircraft within a fifty-mile radius. It is designed for either permanent installation or for portable use. STAR's components are self-contained in its own trailer, and like SPAR, it can be put into operation with lightning speed.

SPAR is a simple, rugged, reliable and accurate precision approach landing system. It has already undergone exhaustive tests by both military and civilian organizations, and has won the Air Force stamp of approval. Light and compact, it's ideal for landing fields where mobility is a prime requisite.

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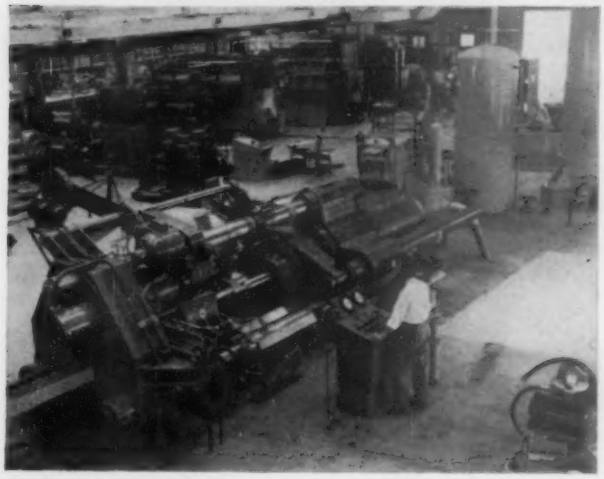


LOEWY HYDROPRESS will extrude high-temperature materials, including new alloys and experimental refractories.

CERAMICS FURNACE AREA houses the equipment used in sintering and melting ceramics at high temperatures.

New GE Lab to Push Research In High-Temperature Materials

By George L. Christian

Schenectady, N. Y.—A new $5-million metals and ceramics facility, which will help scientists extend the frontiers of knowledge concerning very-high-temperature materials, will be opened this week at the General Electric Research Laboratory near here.

Built at The Knolls, the building is part of a $13-million expansion of GE's Research Laboratory. The new facility underlines the company's belief in the growing importance of metallurgy and ceramics in the nation's industries—particularly aviation with its expanding stable of supersonic jet planes, ramjets and rockets.

The Metallurgy and Ceramics Department is headed by Dr. J. H. Hollomon who has a staff of 210, nearly half of whom are professional personnel.

The importance of heat—and the need for greater knowledge concerning it—in turbojets is underscored by the fact that the efficiency of jet engines increases with firing temperature, within certain ranges.

Hollomon sees two general approaches toward the attainment of higher jet operating temperatures: cooling and other mechanical techniques, and developing improved materials that can take higher temperatures without oxidizing or becoming brittle.

Developing and investigating new materials is one job of Hollomon's group. Right now, the main interest in the high-temperature field is cermets and refractory metals, but the final answer may lie in a new, as yet undeveloped, material.

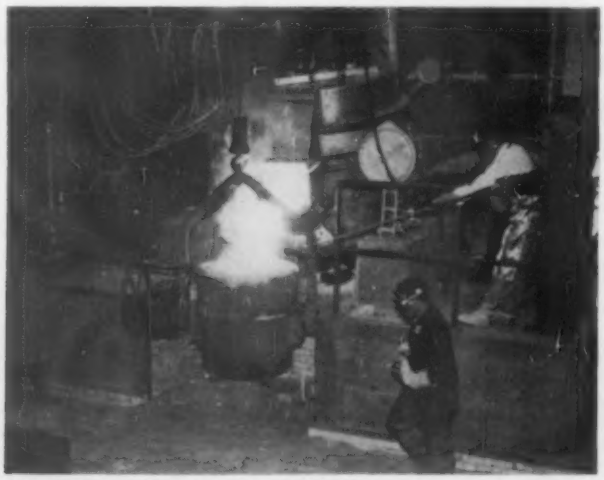
Hollomon spelled out for AVIATION WEEK the development outlook for the next 10 years in regard to jet turbine buckets—one of the toughest development areas in the fiield of high-temperature materials.

Cermets

Several cermet combinations, such as titanium carbide or chromium oxide, used with a binderlike nickel-chromium-cobalt, are light, strong, oxidation-resistant, and have good high-temperature resistance up to 1,800F, but they have low shock resistance, poor thermal shock resistance and virtually no ductility at room temperature.

The lab intends to find out why

PLANETARY MILL will roll a 1x11x20-in. hot steel slab into 0.1-in.-thick sheet in a single pass.



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cermets are so brittle and how sintering occurs. Solutions to these problems may shed some light on how to come up with cermets ductile enough to make them usable in jet engines.

Hollomon says GE's Carboloy division is doing extensive work along these lines for the company's jet engine group at Evendale, Ohio.

Refractory Metals

To be practical for jet-engine use, refractory, or high-melting-point, metals have to be relatively inexpensive, available in sufficient quantity and not too heavy. The most promising metals are molybdenum and chromium, Hollomon says.

Molybdenum and its alloys can be made as strong at 1,800-2,000F as S-816 is at 1,500F (S-816 is an austenitic alloy currently used as the standard turbine bucket material).

But moly poses several tough problems which have to be solved before it can go into a jet turbine. Because it oxidizes readily, it cannot be used bare but must be coated. A suitable coating material must have these properties: It must be completely impervious, ductile, adherent and, of course, high-temperature resistant. But the material need not be as strong as the base metal.

Two other tough posers are that molybdenum purity must be controlled very carefully—to within .001% or better—to make the metal acceptably ductile at room temperature and, because moly is so strong at high temperatures, it is extremely difficult to change the metal's shape when it is hot.

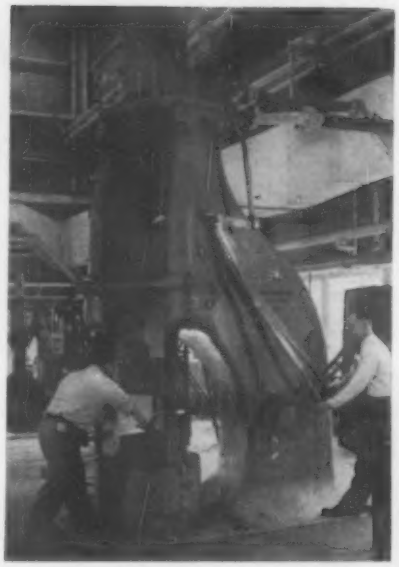
Chromium is somewhat the opposite of molybdenum—it has excellent high-temperature oxidation resistance but has very poor ductility at low temperatures. Chromium's oxidation resistance is good up to 2,000F. Above this it volatilizes. This can be improved, however, by alloying, according to Hollomon.

If chromium is made ductile, it must remain ductile when alloyed. And it must be alloyed to be used for turbine buckets, because it is not strong enough in its pure form.

Hollomon listed these companies and agencies who have made substantial progress in developing a ductile, fabricatable chromium: Bureau of Mines, Albany, Ore.; Battelle Memorial Institute, Columbus, Ohio; Aircraft Research Establishment, Melbourne, Australia, and GE's Research Laboratory here.

Better Austenitics

Hollomon thinks existing austenitic alloys, such as M-252 and Waspalloy, can be made as strong at 1,700F as standard S-816 is now at 1,500F. Currently their limit is in the 1,550-1,600F range.



FORGING HAMMER can hot-work largest ingots produced in GE's new facility.

The extra 100 or so degrees may be gained by development of new compositions made possible by vacuum melting or inert atmosphere arc melting or by use of very high purity metals.

Above 2,500F

The difficult problems of oxidation of metals above 2,500F justifies a substantial and basic research program and a large laboratory effort to overcome the low ductility deficiencies of ceramics, says R. M. Parke, manager of the Materials Application and Evaluation section. These investigations would apply metallurgical techniques to study the deformation mechanisms and thermal shock resistance characteristics of ceramic materials. Parke hopes that such research will "give us clues to the development of ceramics which will have acceptable low-temperature ductility."

"We are progressing towards our goal and our goal is coming to us at the same time," he said. "This is because development of more ductile ceramics is progressing and, simultaneously, metallurgists are learning to handle more brittle materials. The result will be jet engines designs which will accept the low-ductility materials we are striving for."

Parke says that his investigations have not yet included intermetallic compounds, such as carbides and nitrides. He wants to investigate these, however, because of their exceedingly high melting points—although they exhibit the familiar undesirable features of low ductility and, sometimes, poor oxidation characteristics.

Microstructure Investigation

Still another effort being made by GE scientists to obtain suitable materials for turbine buckets is headed by Dr. J. E. Burke, manager of Ceramic Studies.

Burke told AVIATION WEEK he has great hopes for cermets, such as aluminum oxide bonded with chromium. He feels the key to obtaining cermets which are sufficiently ductile for jet engines lies less in finding the correct chemical combination and more in getting the correct microstructure.

So his research centers around microscopic investigation of how fracture in cermets is initiated and how cracks propagate through the material.

His staff also is delving into the relationship between strength and temperature of non-metallic materials, including intermetallics. Among his projects is an investigation into the deformation and plastic flow of materials such as aluminum oxide.

The Laboratory

The new $5-million research facility has four specific purposes:

- **Develop new metal and ceramic materials** and techniques for processing them.
- **Enlarge significant processes** to pilot-plant scale and estimate cost of these processes.
- **Transfer proven processes** to operating divisions of the company, where they can be developed into profitable new businesses.
- **Prepare metal and ceramic samples** for experimental study elsewhere in the laboratory or other company facilities.

Housed in the 288x130-ft. building are a steel shop complete with furnaces; hot and cold working mills; an extrusion press; drop and forging hammers; heat treatment furnaces; a ceramics laboratory, and offices.

It has ten furnaces, ranging in capacity from 1/10 lb. to two thousand pounds. These include vacuum, inert arc and vacuum induction furnaces.

The fabrication lab has the third Sendzimir planetary, hot-strip mill installed in this country. The mill, powered by a 350-hp. electric motor, rolls a 1x11x20-in. hot steel slab into sheet steel 0.100 in. thick in one pass.

Among the "firsts" claimed for the new lab is a Birdsboro hot slabbing and rod mill whose control is unique. According to GE, it is the only reversing rolling mill in the U. S. powered by a mercury arc rectifier—the first in the world to be controlled exclusively by magnetic amplifiers.

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Three Firms Form Propulsion Pool

Research, engineering and production resources of the Marquardt Aircraft Co. (ramjets), Reaction Motors, Inc. (rocket engines) and Olin Mathieson Chemical Corp. (liquid and solid propellants) are being directly coordinated to seek faster advances in propulsion units for missiles and supersonic aircraft.

One of the first tasks of the OMAR program is the developments of propulsion charges for aircraft ejection seats. Objective is a unit that will always fire and that has a thrust-time curve of appropriate shape for safe ejection. Coordination is not limited to such special propulsion applications.

The primary goal is to overcome limitations on applications of rockets and ramjets to missiles and aircraft. One application is certain to be in super-performance aircraft configurations, similar to the French mixed-powerplant Dassault 550 fighter.

Although Olin Mathieson owns a substantial interest in both Marquardt and Reaction Motors, it was considered desirable to set up the formal OMAR technical advisory committee to tie together the mechanical experience of the two engine makers with Olin Mathieson's in special fuels.

The committee chairman is Harry A. Sosnoski, aviation advisor to Olin Mathieson's president. Sosnoski was Washington representative for Lear, Inc., after leaving the Navy in 1954. His last Navy assignment was commanding officer and director of the Office of Naval Research's Special Devices Center.

Other committee members include: T. F. Walkowicz of Laurance Rockefeller's staff, vice chairman; John A. Drake of Marquardt; William P. Munger and Warren P. Turner of Reaction Motors; and L. Kermit Herndon, Joseph H. McLain and John J. O'Neill, Jr., of Olin Mathieson.

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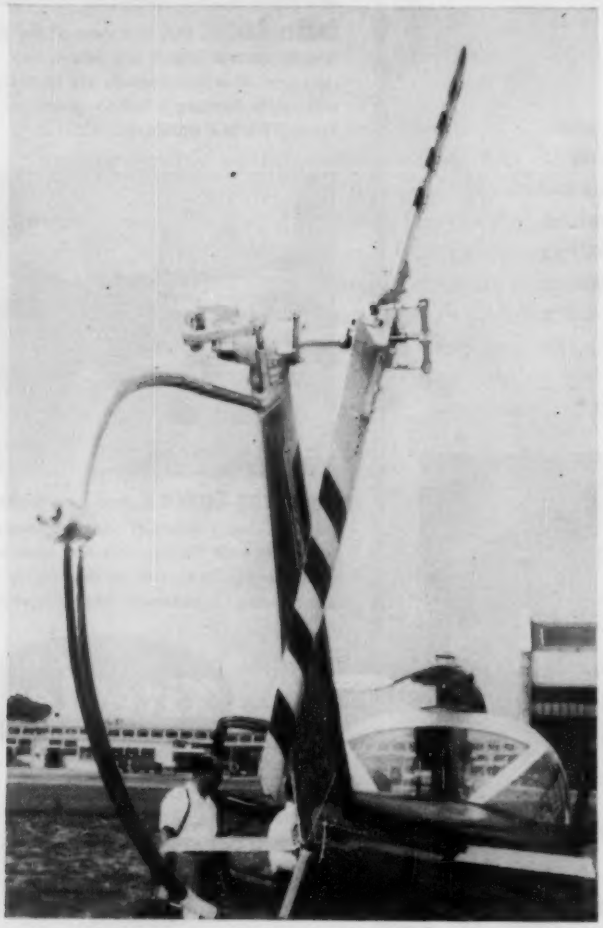
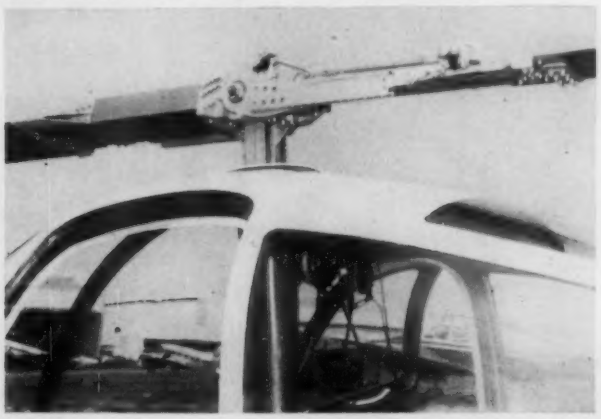
THE CH-I all-metal helicopter manufactured by the Cessna Aircraft Co., Wichita, Kan., is now on tour of military installations. The manufacturer plans to sell the machine for commercial use but military orders must come first if the aircraft is to sell at $40,000 to $60,000.

Cessna Demonstrates New Helicopter



TAIL ROTOR GEAR BOX of the CH-I helicopter holds two bevel gears and four standard anti-friction ball bearings. Tail rotor is mounted with four machine screws which are held in place by two bolts.

COCKPIT INSTRUMENT PANEL of the four-passenger CH-I has radio controls located on the console between seats.



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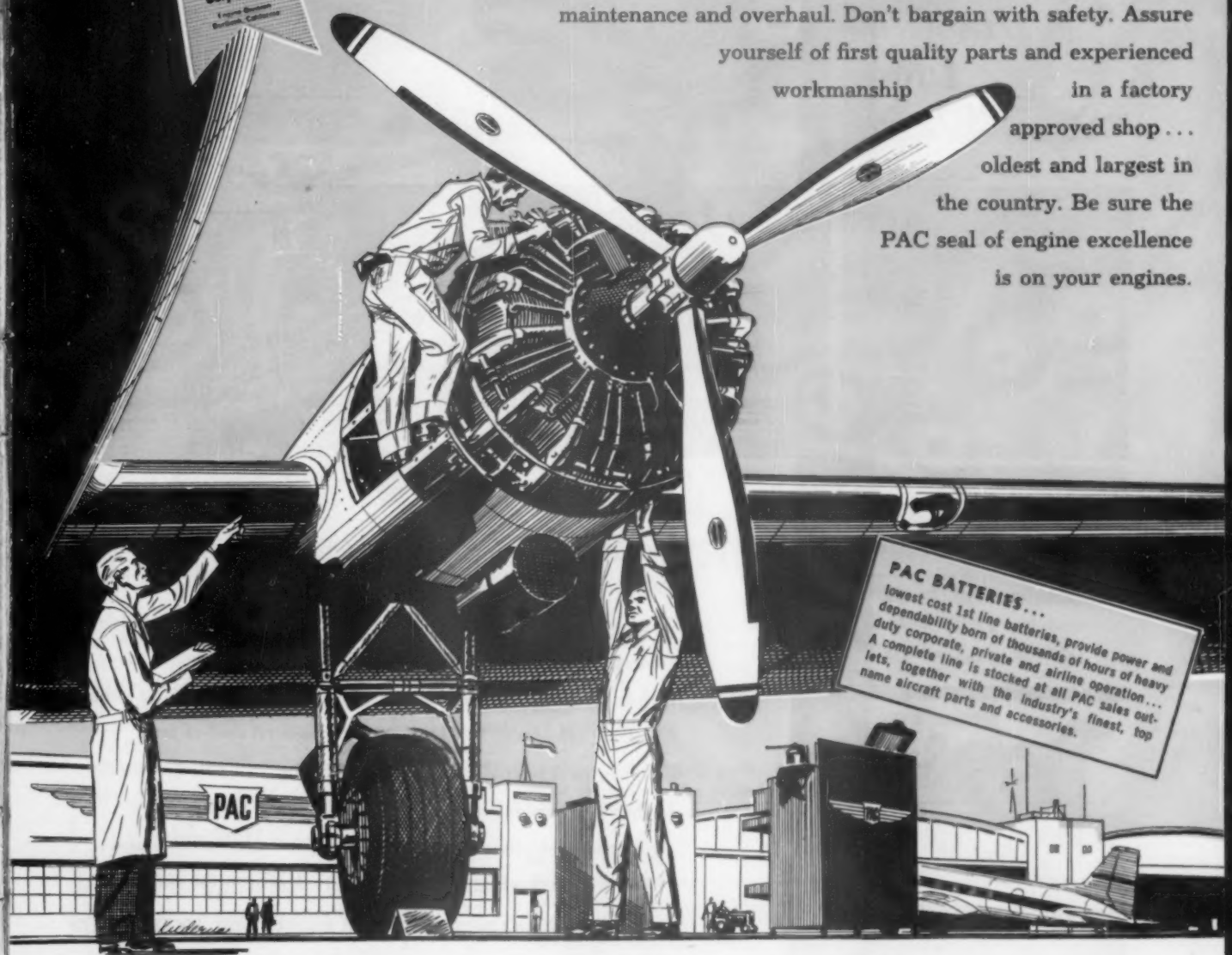

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A vacuum chuck is used for hold-down effect of any part up to 40-in.-dia. A walk-in pit, which allows easy inspection of the hydraulic system, has been included beneath the machine.

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Paris—Sncaso's SO-9050 interceptor version of the French aircraft builder's Trident series is expected to match the performance of the SO-9000 that reached 930 mph. last June on two of its three SPR rocket motors.

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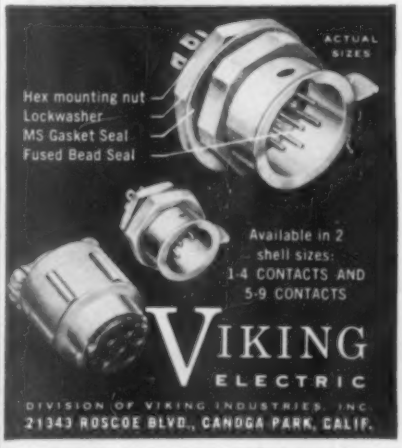

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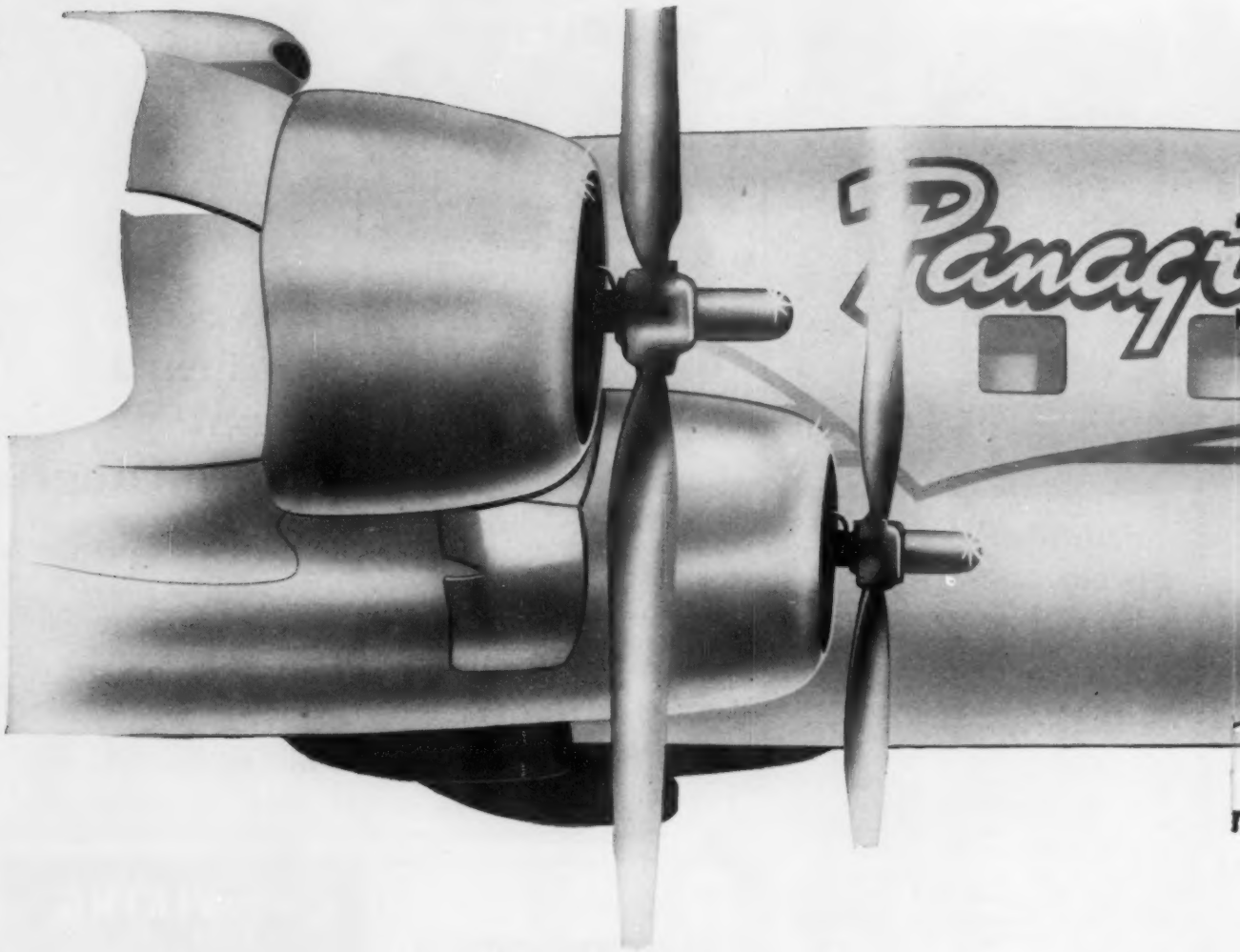

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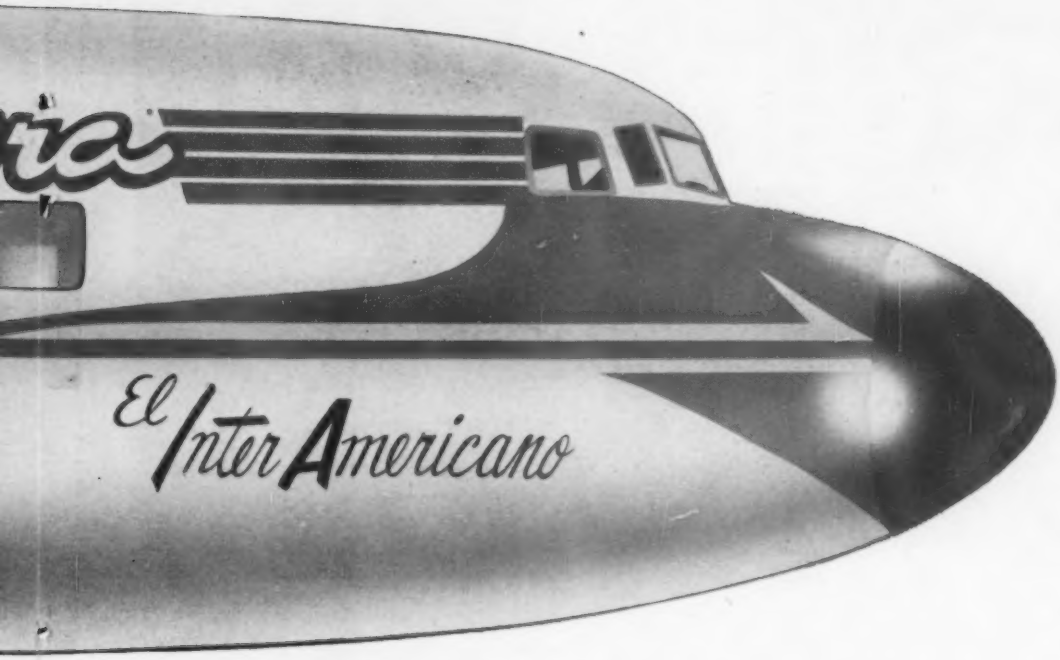

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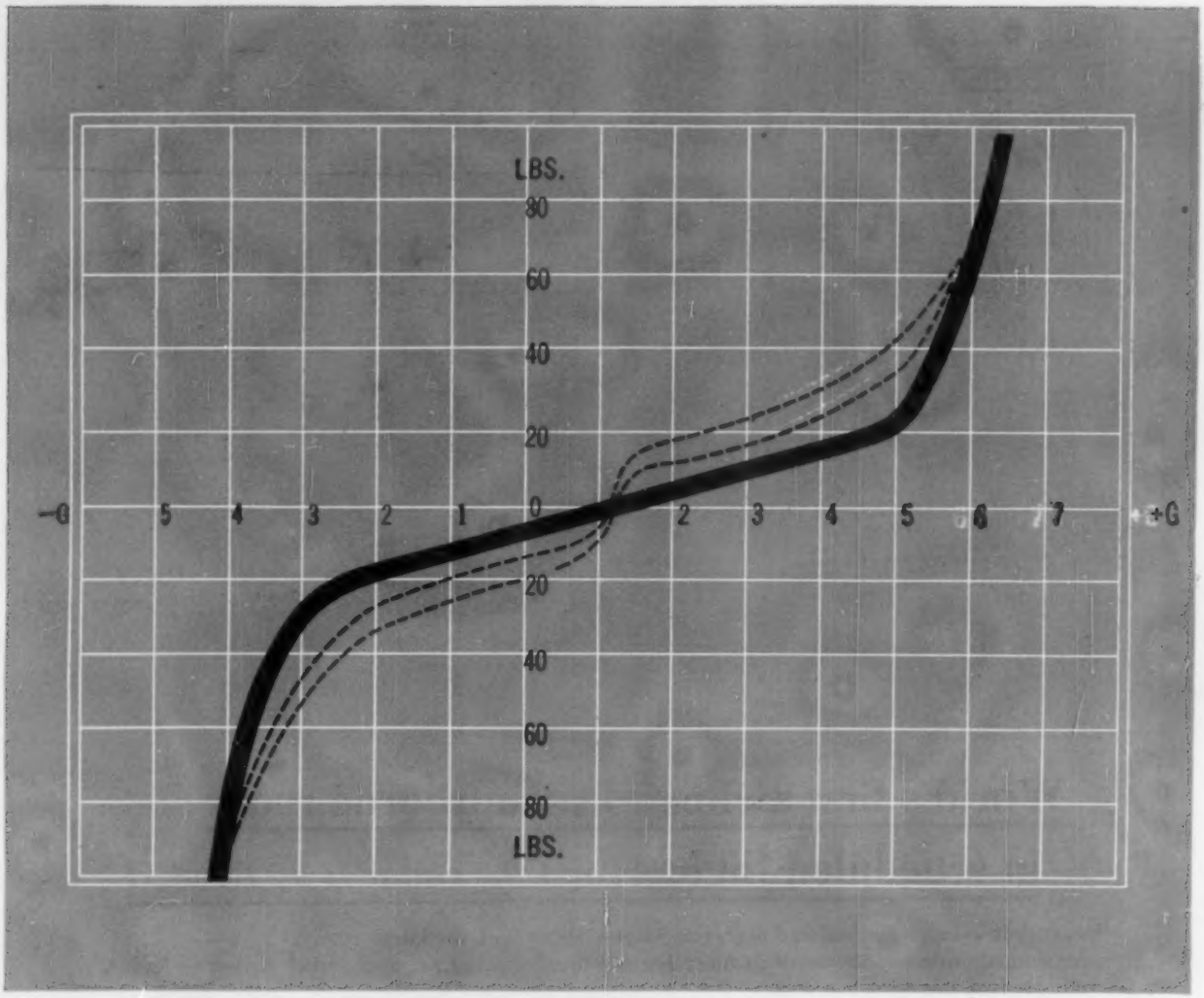

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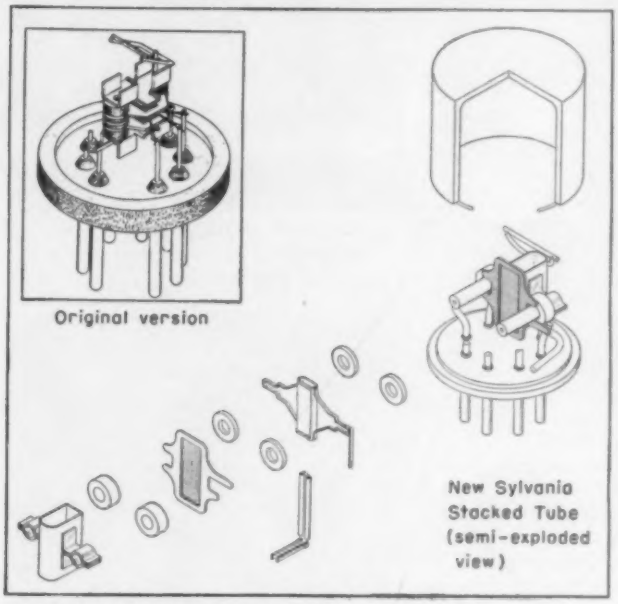
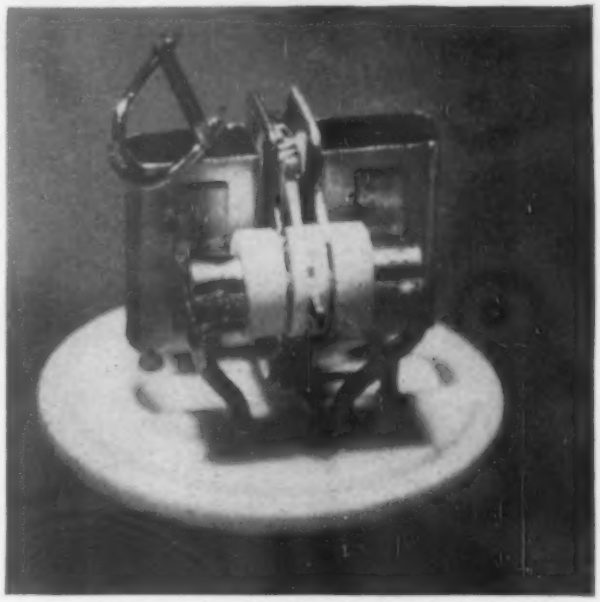
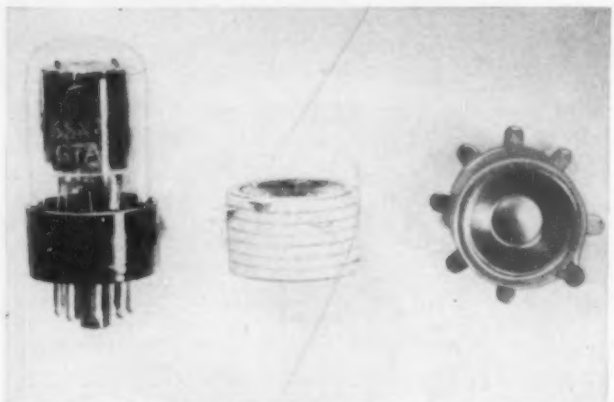
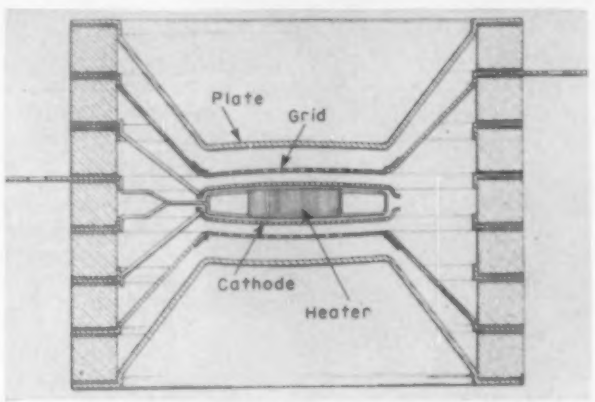




NEW STACKED CERAMIC TUBE developed by Sylvania mounts elements on horizontal posts. Original model (inset) used vertical posts.





ANOTHER APPROACH—Eimac tube, smaller and higher-powered than conventional tube, is nested stack of electrodes and spacers.

Rugged Stacked Ceramic Tubes Move Into Pilot Production

By Philip J. Klass

Stacked ceramic tubes operating in ambient temperatures of 300-400C are moving into the pilot production stage and will be available in limited quantities for avionics industry evaluation in the near future. Developed by Sylvania and Eitel-McCullough under Navy Bu-Ships and USAF sponsorship, the tube projects were first revealed last year (AW June 28, 1954, p. 61).

The new stacked tubes feature more rugged construction to withstand aircraft-missile vibration and shock. They are specially designed to facilitate mechanized assembly and fabrication.

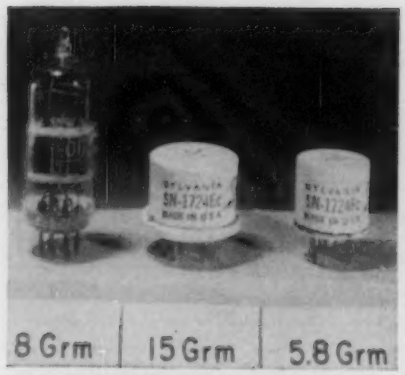
Eimac expects to have a stacked ceramic twin-triode, equivalent to the 6SN7 except for plate dissipation which runs three to four times greater, available in sample quantities by the end of the year, according to Harold E. Sorg, company vice president. Stacked ceramic versions of a twin-diode and a pentode equivalent of the 6AK5 will follow later.

Sylvania is building a pilot quantity of twin-triode equivalents to the 6J6/6101 for USAF service tests with delivery scheduled for next spring. Some of the tubes are scheduled to be farmed out to Aeronautical Radio, Inc., for evaluation in airline operations. Sylvania also has developed beam power and RF pentode versions of its stacked tube, according to William R. Wheeler of the company's Kew Gardens, N. Y., Product Development Labs.

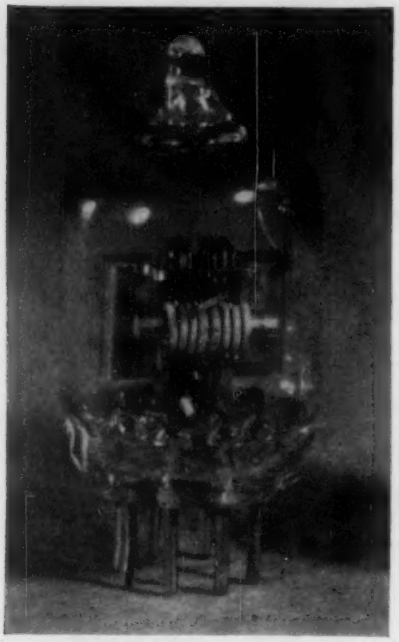
Redesigned Sylvania Tube

Sylvania has redesigned the original tube, revealed last year, so that its size, weight and performance now equal or exceed its 6J6/6101 equivalent, according to Wheeler.

Like the original version, the new Sylvania model consists of a build-up of electrodes (plate, grid, cathode) stacked on two posts with ceramic spacers replacing mica (used in conventional tubes) to permit high-temperature operation. Most noticeable difference between the old and new versions is that the latter has its tube elements stacked



NEW SYLVANIA stacked tube is smaller and lighter than earlier model (center) and conventional tube (left).



NEW BEAM POWER TUBE made by Sylvania uses improved stack construction.

on horizontal rather than vertical posts (see photo, page 61).

There are other less obvious design changes, however, which Wheeler reports have reduced interelectrode capacitance, increased over-all tube structure rigidity and improved thermal efficiency. By substituting ceramic posts and a new clamping arrangement to secure the stack of electrodes, instead of the previously-used metal posts and rivets, interelectrode capacitance has been cut below that of an equivalent tube of conventional construction in most instances, Wheeler reports.

A comparison of characteristics for the new SN-1724F with those for a 6101 are shown below:

	SN-1724F$_g$	6101
• I_b	6.0 ma.	8.5 ma.
• G_m	6,500 μmho	6,000 μmho
• μ	41	38
• C_{g-p}	1.1 $\mu\mu$fd.	1.5 $\mu\mu$fd.
• C_{in}	2.2 $\mu\mu$fd.	2.0 $\mu\mu$fd.
• C_{out}	0.3 $\mu\mu$fd.	0.4 $\mu\mu$fd.

Of particular importance for aircraft and missile use, the new SN-1724F$_g$ shows relatively little spurious noise under vibration. Compared to a maximum of 25 mv. possible with a 6101 excited with 2½G at 25 cps., the new Sylvania tube reportedly generates only 10 mv. noise when excited with 15G at 40 cps. An added advantage of the new tube is that it consumes only 340 ma. of heater power as compared with 450 ma. for a 6101, Wheeler says.

Other Stacked Tube Types

Sylvania also has constructed stacked ceramic versions of beam power amplifiers (see photo, lower left).

Plate-to-screen current ratios of 20 to 80 have been obtained in experimental models, which Wheeler calls "very good." Power output efficiency and distortion figures are equivalent to those of conventional tubes, he said.

Because of a lower grid temperature resulting from the new stacked design, greater grid drive is possible with "unusual freedom from primary and secondary emission effects from the control and screen grids," Wheeler reports.

Sylvania has constructed an RF. pentode which employs the same basic structure as the beam power tube, except that the beam forming tubes are extended to provide the primary shielding between grid and plate. A stem shield also has been added.

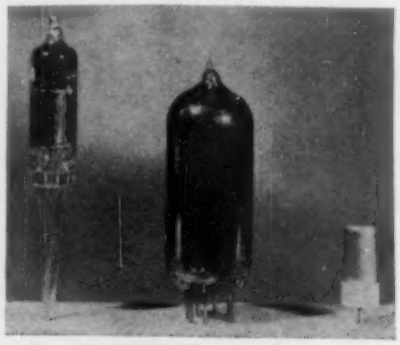
The original stacked tube in a ceramic housing weighed almost twice as much as its conventional counterpart (15 vs. 8 grams). Sylvania's new stacked twin-triode equivalent of the 6101 weighs only 5.8 grams, 30% less than its conventional counterpart. This has been accomplished by cutting the thickness of the ceramic shell wall from 0.07 to 0.03 in. and switching from a nine-pin to a smaller seven-pin miniature base.

The new Sylvania stacked tube, like the original version, can be housed in a ceramic shell or—where high-temperature operation is not required—in a glass envelope. (The subscript "c" or "g" after the type number indicates the kind of housing.)

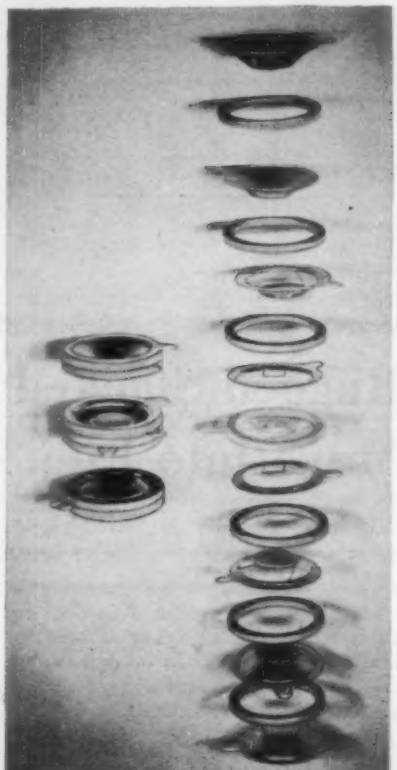
The company also is investigating the use of a metal shell which can be used as an external anode for a beam power tube to provide better heat conduction or as a shield for an RF amplifier. An added advantage is lower cost.

In addition, Sylvania is looking into "tubulated" versions of both ceramic and metal shells to simplify the evacuation and shell sealing process. With evacuation through a small copper tube in the shell roof, the shell can be sealed to the base without need for

'TUBULATED' SHELL makes it easier to evacuate and seal metal or ceramic tube envelopes, Sylvania finds.



MIDGET AT RIGHT is new Sylvania voltage reference tube. Compare conventional T-3 (left) and 7-pin miniature tube (center).



NESTED STACK CONSTRUCTION of Eimac tube is shown in exploded view. Individual tube elements and ceramic spacers are joined into three sub-assemblies, then brazed together to complete tube.

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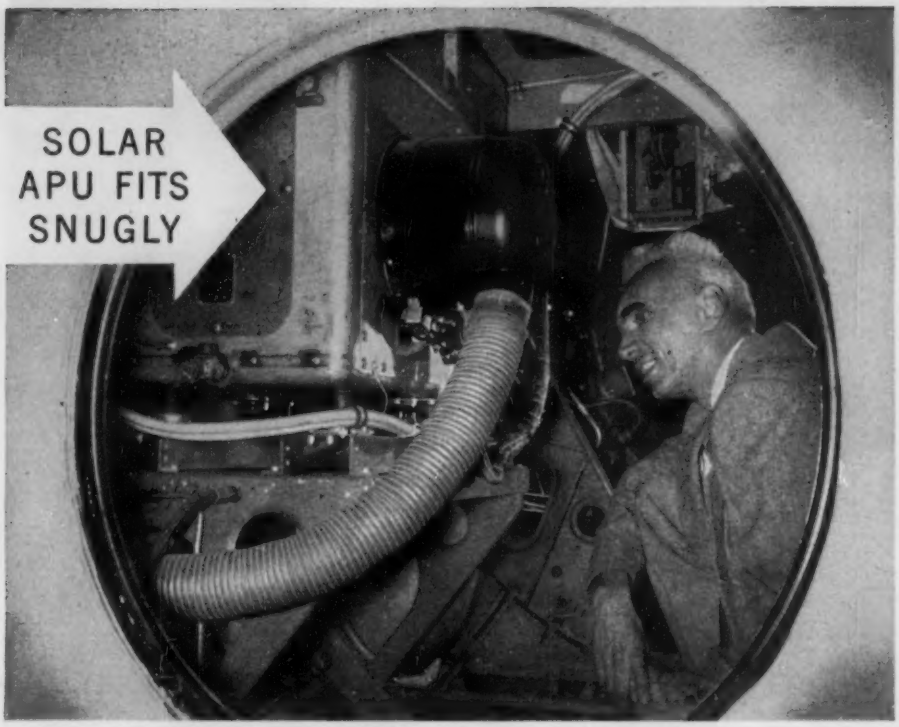

William H. Monson, Lockheed engineer, examines Mars APU installation.

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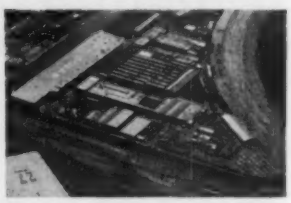

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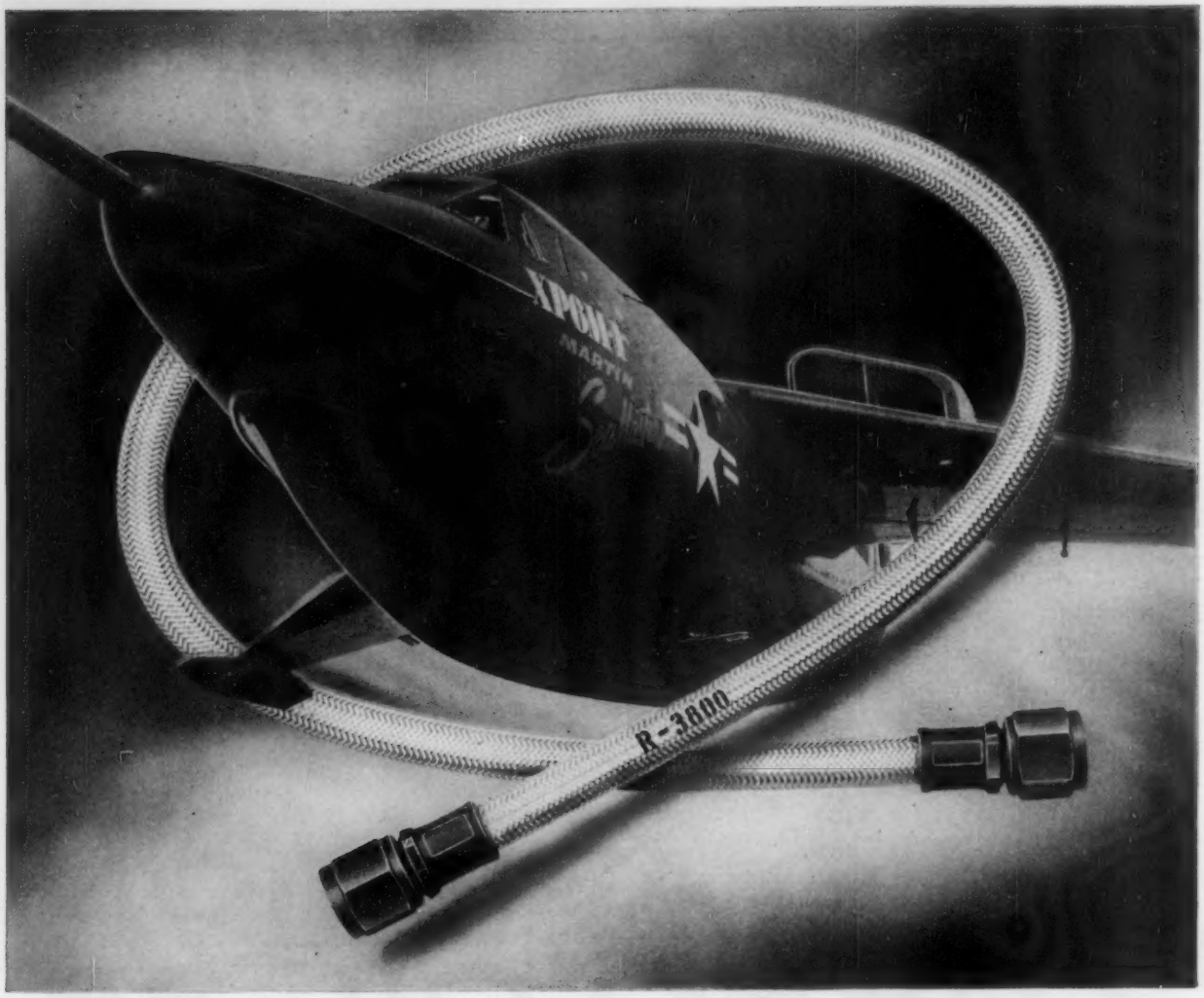

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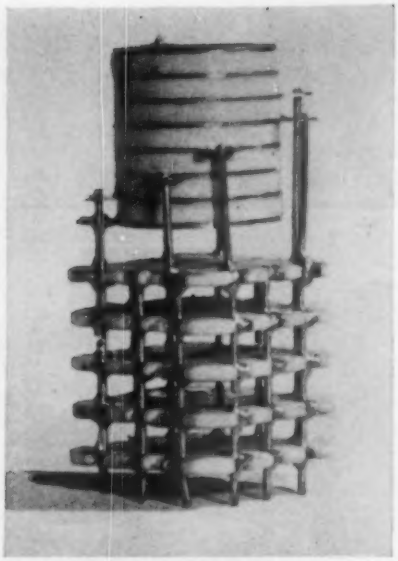


TINKERTOY & STACK—Eimac tube is shown mounted atop Tinkertoy-type module.

performing the operation under an evacuated bell jar.

Sylvania has applied the same stacked-ceramic design to the construction of a tiny new gas diode voltage regulator tube which reportedly shows stability characteristics three to five times better than present conventional VR tubes and measures only 0.3 in. in dia. x 0.6 in. long. (For a size comparison with conventional VR tubes, see photo, p. 62.)

Figures cited by Wheeler indicate the following characteristics for the new Type SC-2122A tube:

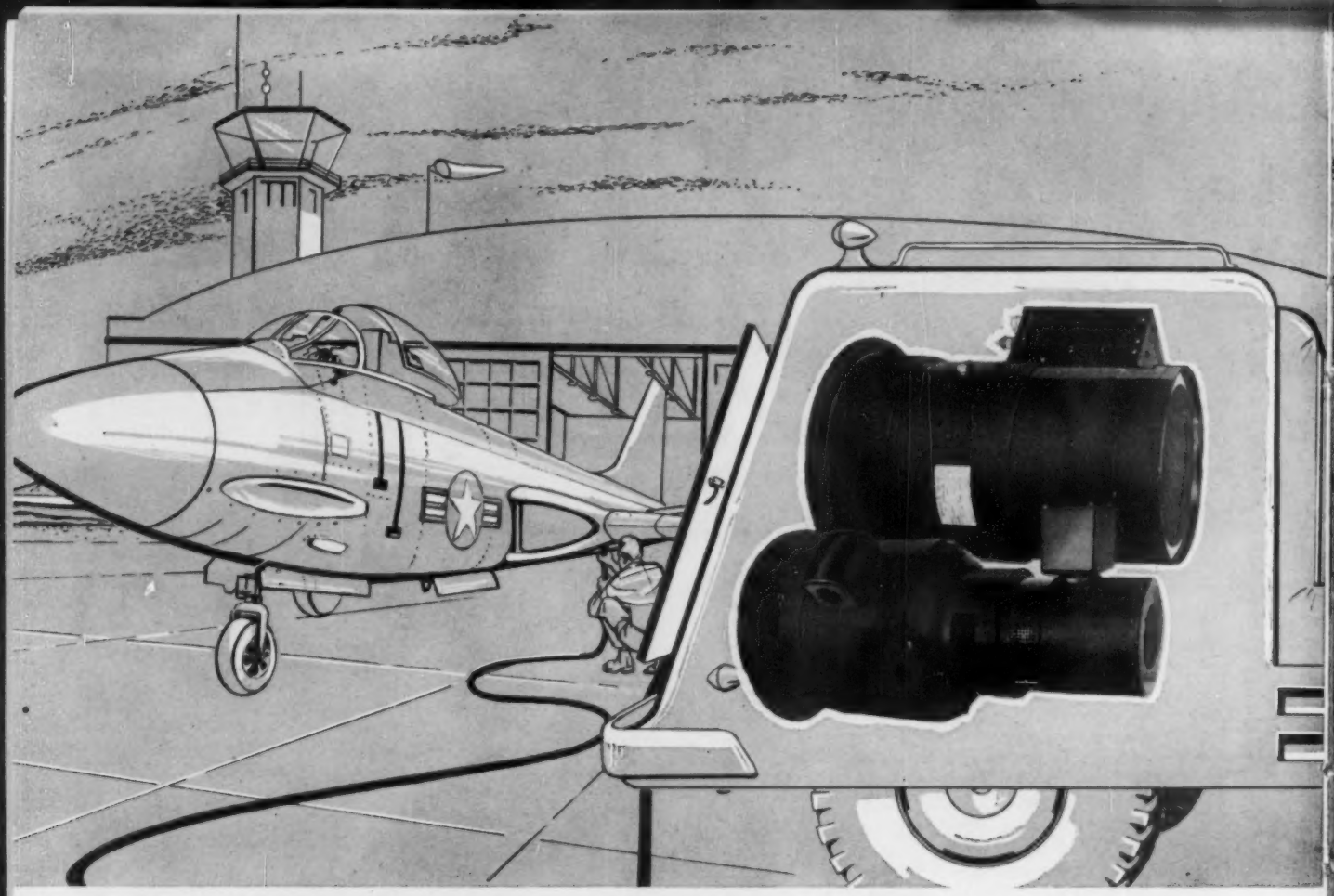
- **Operating voltage:** 84.5 v.
- **Current range:** 1½ to 3½ ma.
- **Regulation:** 2 volts max.
- **One hour drift:** 12 mv.
- **Voltage jump:** Under 1 mv.
- **Vibration noise:** Under 0.3 mv. at 15G, 40 cps.

Eimac Tubes Soon

The Eimac CD-8 stacked-ceramic high-power version of the 6SN7 is expected to be available in sample quantities by the end of the year. The CD-8, with each of its twin sections rated for 15-20 watts dissipation, will be particularly suited for use in servo amplifiers where considerable output power is required.

A slightly smaller, lower-powered twin-triode, the CD-16, measuring only ⅝ in. in diameter, should be available in sample quantities early in 1956, as will a twin-diode, according to Eimac vice president Sorg. The CD-16 is small enough to fit atop a Tinkertoy type module, where its terminals solder directly to the module's riser wires. (see photo, above).

Eimac is developing an RF pentode equivalent of the 6AK5, called the



For stationary, or vehicle-type engine-driven ground power units.

Engineered General Electric generators add dependability to your ground power products

Since before World War II, manufacturers of stationary and self-propelled engine-driven ground power equipment have turned to General Electric for the best in a-c and d-c generators, and for quality engineering services to develop and apply these components to their products.

BETTER ENGINEERING. Thousands of a-c and d-c generators have been applied to a variety of requirements by General Electric engineers. The resultant resource of experience benefits you. G-E personnel will work closely with you in designing generators to meet space and mounting limitations and electrical requirements. Such experience and co-operation assures you of better product performance.

BETTER PERFORMANCE. G-E generators are manufactured to rigid quality controls required by commercial and military specifications. Easily installed a-c and d-c generators are engineered to require a minimum amount of maintenance and will give your product more precise power with longer, more dependable life.

ENGINEERING HELP. If you have a generator or "packaged" electrical equipment problem in ground power, bring it to General Electric. Qualified design and application engineers are ready to assist you. For more information contact your nearest G-E Apparatus Sales Office. *General Electric Company, Schenectady, New York.* 814-2

GENERAL ELECTRIC

CD-15, which should be available sometime next year.

Sorg said the new stacked Eimac tubes have performance characteristics comparable to those of conventional tubes but with more rugged construction and better high-temperature capability. The company has tested its tubes at 300C and finds that their characteristics remain "stable," Sorg says.

Eimac Design

Eimac's stacked-tube design differs markedly from Sylvania's. The Eimac tube consists of a nested stack of ceramic spacers and metal ring-supported electrodes (grid, cathode, plate, heater) all brazed together to form both the supporting structure and external housing (see photo, p. 62, lower right).

The basic design is easily adapted to a variety of tube types. A twin-diode is constructed by building a double-ended stack with the heater-cathode in the center and the anodes (plates) at either end.

By adding one grid on each side, the tube becomes a twin-triode. By adding an additional grid, it becomes a pentode.

The tube is first assembled in three sub-assemblies: two end sections, each consisting of an anode-grid, and the center section, comprising the cathode-heater. The three sub-assemblies are then evacuated in a chamber, joined and brazed.

The individual electrodes and spacers are designed to be self-aligning, both vertically and axially. This facilitates automation of the whole process or permits rapid manual assembly by semi-skilled personnel, Sorg says.

Prototype machines for mechanized fabrication of the tube elements and assembly into completed tubes are now being developed by Eimac to prove out the basic automation principles. By the end of the year, Sorg reports, some of the operations will be fully mechanized.

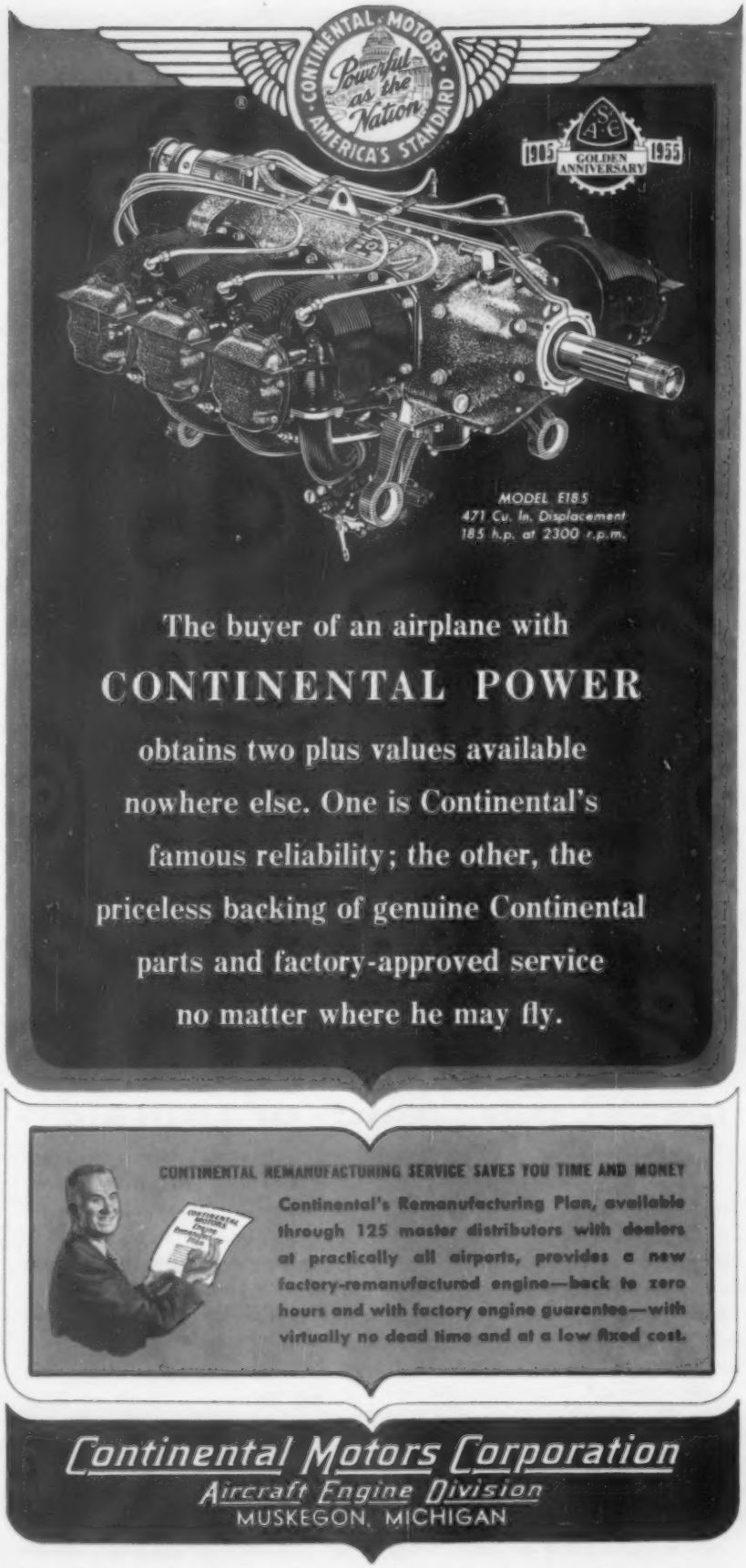
Sorg believes most failures of conventional vacuum tubes can be traced to poor structural rigidity. The extremely rugged structural arrangement employed in the Eimac tubes leads Sorg to predict that they will have almost indefinite life once design and fabrication techniques have been fully mastered.

Eimac's activities in the receiving tube field represent a new venture for the firm. It built its reputation in the field of power and transmitting tubes.

Radar in Iraq

Baghdad—The Iraqi government has approved the necessary measures to establish the first radar station in Iraq.

A group of six British technicians will arrive here shortly to erect the station.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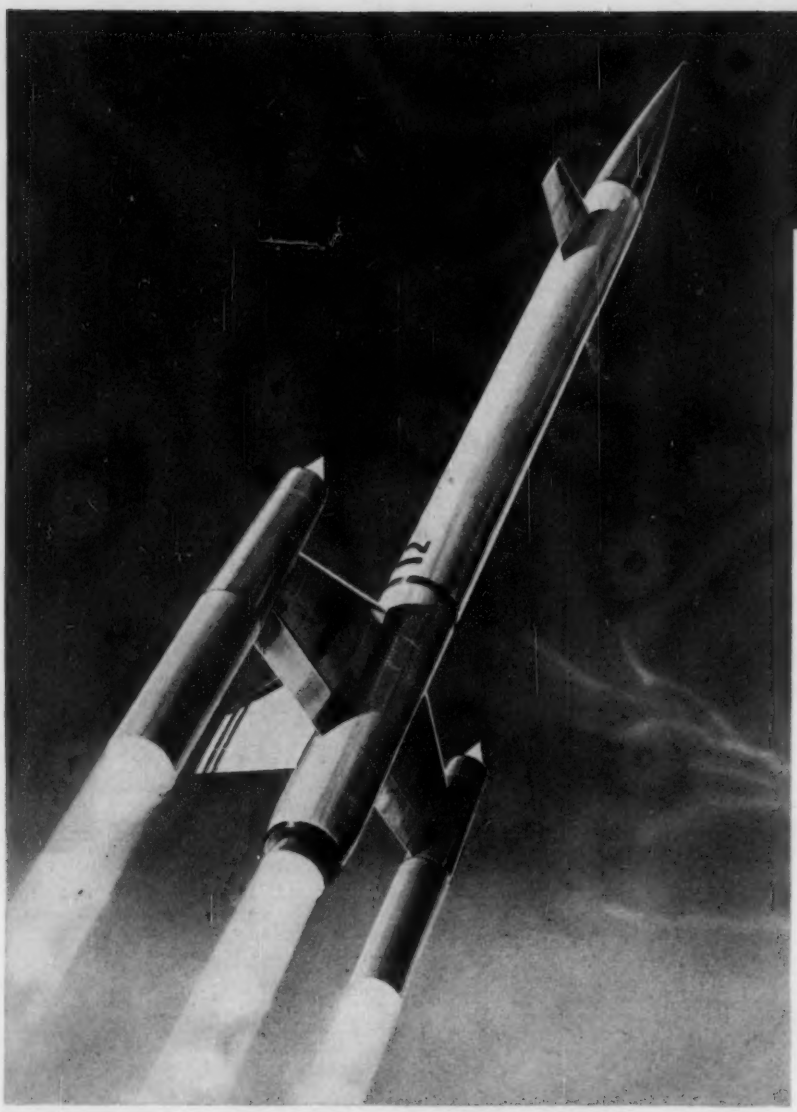
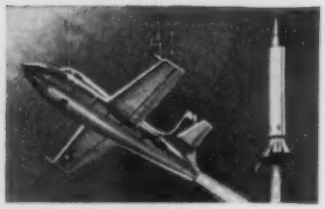
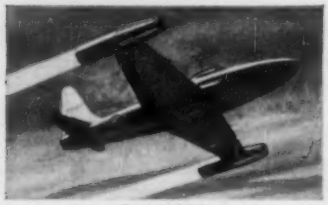




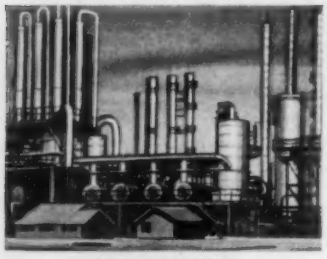
ROCKETS

Reaction Motors rocket engines powered the Air Force's X-1A to piloted-aircraft speed record of 1600 mph-plus, and Navy's Viking to new altitude and speed records for single-stage rockets of 158 miles and 4300 mph.



RAMJETS

Marquardt Aircraft was responsible in 1947 for man's first flight in a ramjet-powered airplane. The supersonic ramjet has since established records in speed, altitude, distance and endurance for air-breathing engines.



PROPELLANTS

Olin Mathieson produces modern chemicals for supersonic power—ammonia, ethylene oxide, nitric acid, hydrazine, dimethyl hydrazine, and solid propellants. Other chemical fuels and propellants are under development.

new team impetus for supersonic propulsion

Added impetus is being given to rocket and ramjet developments by a unique new industrial team. For the first time, mechanical experience in supersonic engine development is linked with chemical experience in the manufacture of special fuels in an integrated research and development program. This has been accomplished by the affiliation of Olin Mathieson Chemical Corporation with Reaction Motors, Inc. and Marquardt Aircraft Company.

A major producer of chemicals and manufactured products, Olin Mathieson makes special fuels at five plant locations. Reaction Motors, Denville, New Jersey, is one of the country's leading developers and manufacturers of rocket engines. Marquardt Aircraft, Van Nuys, California, pioneered the ramjet engine and is the outstanding manufacturer of such power plants for military aircraft use.

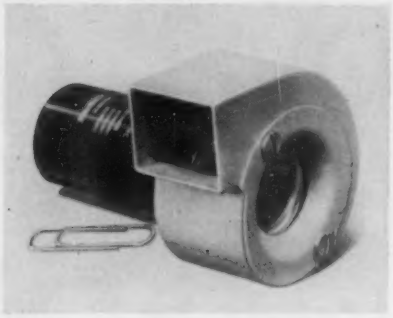
Aimed especially at the advancement of high-speed and high-altitude aircraft and missile power plants, these three affiliated companies provide a combination of skills, experience and facilities which is available nowhere else as an integrated unit.

MARQUARDT AIRCRAFT
OLIN MATHIESON CHEMICAL
REACTION MOTORS

NEW AVIONIC PRODUCTS

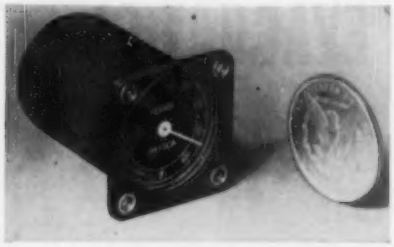
Components & Devices

● Subminiature centrifugal blower for cooling airborne avionic equipment measures only 2⅞ in. long and weighs less than 6 oz. Blower is available with CW or CCW rotating in single or double-ended models. A single-ended 20,000 rpm blower can deliver 13 cu.



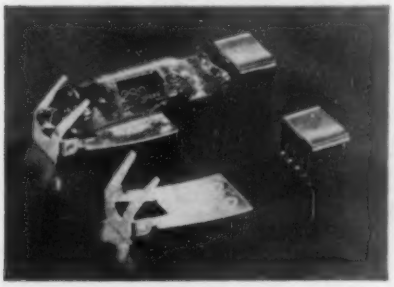
ft./min. at 0 in. static pressure, while a 11,000 rpm unit delivers 7 CFM. Air velocity of the 20,000 rpm model is 3,000 ft./min. Motor is available in single or three-phase types for 400 cps. or variable frequency operation. **Eastern Air Devices, Inc., 389 Central Ave., Dover, N. H.**

● Running-time meter, Model 7008, for installation in avionic equipment to show total in-use time, records up to 10,000 hr. on a dial-type face. Unit, measuring 1¼ in. dia. x 2¾ in. long and



weighing less than 6 oz., is available in either 60- or 400-cps. models. Device hermetically sealed. **Haydon Manufacturing Co., Inc., Torrington, Conn.**

● Tube retainer for subminiature tubes, either flat-press or button base, prevents horizontally mounted tubes from working loose under shock and vibration. Tube retainer reportedly has been tested at under 20G vibration at 2,000 cps. **P. R. Mallory & Co., Inc., Government Sales Dept., 3029 E. Washington St., Indianapolis 6, Ind.**



● Environment-proof limit switches, completely sealed, are now available in a new line designated Series "EP." Units reported meet vibration and shock tests of MIL-S-6744 and immersion tests of MIL-E-5727A. Preliminary data sheet P103 gives application data. **Micro Switch, Freeport, Ill.**

Instrumentation

● Strain gage power supply, provides up to 1 amp. at 5 to 15 volts, continuously adjustable to within 0.1% in two ranges. Ripple is quoted at less than 0.05% and regulation at 0.1%. Unit is available for operation from 115 v., 60 cps. or from 400 cps. for airborne use. **Eagle Instruments, Inc., 14757 Keswick St., Van Nuys, Calif.**

● Miniture pressure transducers, employing unbonded strain gage pick-offs, can be used to measure absolute, differ-

ential or gage pressure over temperature range of −65F to 250F with no more than 0.01%/deg.F change in sensitivity. Model P130 measures absolute pressure and is available in ranges of 0-5 to 0-150 psia. Model P131 differential pressure transducer covers range of ±2½ to ±25 or 0-5 to 0-150 psid. Model P132 gage pressure unit is available with range of 0-5 to 0-150 psig. **Statham Laboratories, Inc., 13401 West Olympic Blvd., Los Angeles 65, Calif.**

● Accelerometers—new series of single and multi-axis devices for use in yaw dampers, acceleration limiting and similar applications—are available in ranges of ±0.1G to ±50G. Units are non-pendulous, linear and employ potentiometer pick-offs. Application data is available in four-page folder. **Cedar Engineering Inc., 5806 W. 36th St., Minneapolis 16, Minn.**

● Midget-floated rate gyro, Model 10RG, possibly the world's smallest,

measures only 1 x 1 x 1 in. and weighs 1¼ oz., including mounting housing. Unit consumes 3 watts of 400 cps. power, has damping ratio of 0.7 ± 0.4 of critical over temperature range of −55C to 75C. Unit is reported to have high signal-to-noise ratio, low hysteresis, and is capable of measuring very low angular rates. **Gyroscopics, Inc., Box 226, New Hyde Park, N. Y.**

Laboratory Equipment

● Power meter, Model P-2, is a true rms. indicating meter which measures CW and pulse power over the frequency range of d.c. to 11,000 mc. in milliwatts and db. **Polarad Electronics Corp., 43-20 34th St., Long Island City.**

● A.C. power supply is available in standard models or designed to customer specs—with frequencies ranging from subsonic to supersonic, fixed or variable, with accuracies from 0.5% to 0.001%, regulation of ½% from no load to full load and maximum full load distortion or less than 2%.

Power ratings from milliwatts to kilowatts, single or multiphase, are available. Input power can be d.c. or a.c., single or multi-phase. Power supply, called Inverton, uses no rotating equipment. **Behlman Engineering Co., 114 So. Hollywood Way, Burbank, Calif.**

Test Equipment

● Digital ohmmeter, Model DO40, a self-balancing wheatstone bridge, gives

ARMY AND AIR FORCE H-21's TAKE TO THE AIR IN CIVIL DEFENSE EVACUATION

121 Top Ranking Government Officials Rapidly Moved To Safety During OPERATION ALERT—1955

At 12:05 p. m. on June 15th when the sirens sounded in the nation's capital for OPERATION ALERT — 1955, 12 Piasecki H-21 helicopters descended upon the Pentagon area to evacuate top government and military officials.

For the first time helicopters were used for a mass evacuation in Civil Defense operations. Minutes later our country's key personnel were miles from the Pentagon enroute to relocation centers.

Helicopter courier service to the Pentagon helped maintain business as usual during the three day period.

Our hats are off to the men and women of the Federal Civil Defense Administration and other participating government agencies.

We salute the pilots and crews of the U. S. Army's 509th Helicopter Transportation Company and the U. S. Air Force's 516th Troop Carrier Group who, with their H-21's, successfully accomplished this air evacuation.

We at Piasecki are proud that the Army and Air Force selected the Piasecki H-21 "Work Horse" helicopters for this important mission.

VERSATILE PIASECKI HELICOPTERS IN EXTENSIVE MILITARY SERVICE

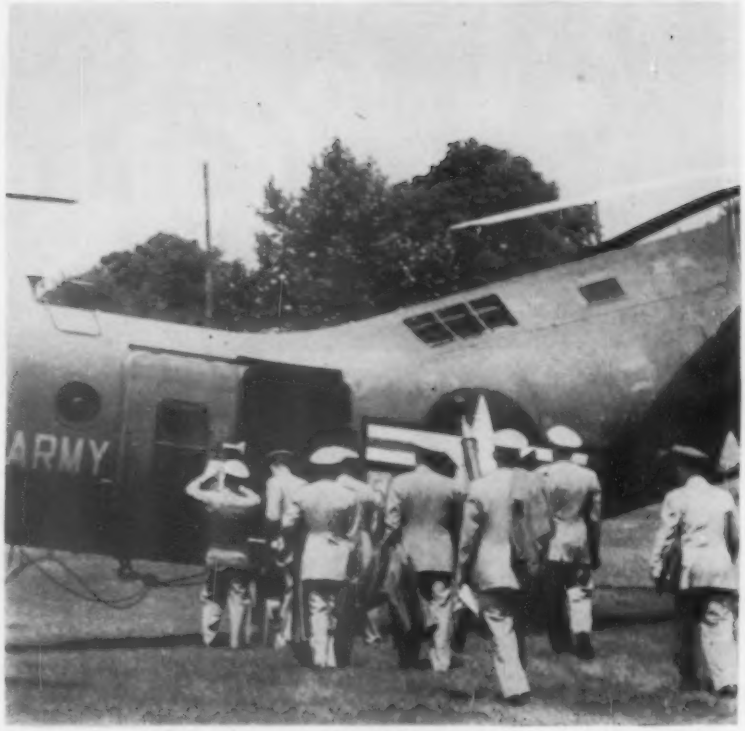
The H-21, the only transport helicopter in service capable of carrying 20 passengers, is used for transporting combat troops and carrying loads of military equipment and supplies weighing up to two tons in Army and Air Force operations.

Operation Alert — 1955 is another typical example of the versatility of this and other Piasecki helicopters.

The operational advantages inherent in the Piasecki tandem rotor configuration are being demonstrated in the many tasks it performs under all types of conditions throughout the world. A commercial version of the H-21 will soon be available for airline and industrial use.

This new carrier is another result of Piasecki's unceasing efforts to improve helicopter performance — to build helicopters to do more jobs and do them better than ever before.

ENGINEERS NEEDED FOR:
DESIGN • AERODYNAMICS • TESTING • STRESS ANALYSIS • AIRFRAMES



Military Evacuees Board H-21 at Pentagon

H-21 Participating in Operation Alert—Philadelphia

H-21's Departing from Pentagon to Relocation Centers

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instantaneous digital read-out accurate microseconds and frequency measure-

Versatile WESTERN GEAR Hoist

selected for new Bell anti-submarine helicopter!

When Bell Aircraft Corporation developed its new HSL-1 helicopter for Navy anti-submarine detection and rescue work, it selected Western Gear to design and manufacture the airborne hoist aboard the unique twin rotor aircraft. This Western Gear hoist lifts 800 lbs. at 50′ per minute. The hoist shown in inset above, weighing 28 lbs. and similar in design to that selected by Bell, can lift 400 lbs. at 100′ per minute, spooling more than 100′ of 3/16″ cable. By modifying the gear train it can lift up to 1600 lbs. at 25′ per minute. A level wind assures accurate spooling and the motor is equipped with radio noise filter to comply with AN specifications.

Western Gear's more than 40 years of experience supplying important components for aircraft of practically every description was a major factor in its selection by Bell to design and manufacture this vital hoist for airborne use. Knowledge obtained since 1888 enables Western Gear to provide a speedy, economical solution to any problem involving the mechanical transmission of motion or torque. Why not avail yourself of this experience to solve your problem? Western Gear engineers will be glad to offer their help and recommendations from your blueprints or specifications. Address General Offices, Western Gear, P.O. Box 182, Lynwood, California.

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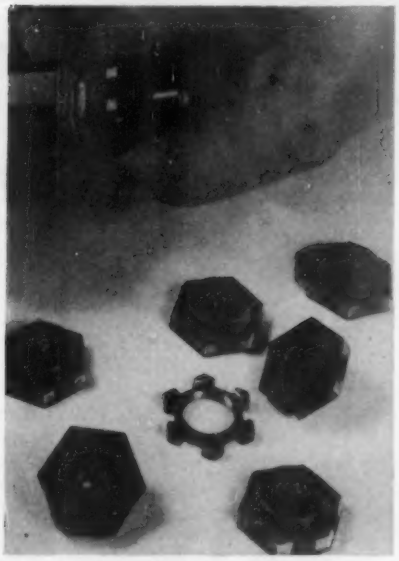
Seattle and Houston — Representatives in principal cities

WESTERN GEAR
ENGINEERS AND MANUFACTURERS

instantaneous digital read-out accurate to within 0.05% ± 1 digit from 0.1 ohm to 1 megohm in four ranges. Range is indicated by lighted, automatically located decimal point and by symbol for ohms or kilo-ohms in read-out window. **Electro Instruments, Inc., San Diego, Calif.**

● Shake table, Series 8,000, for vibration testing, develops 600 lb. force over the frequency range of 5 to 5,000 cps. Frequency response of shake table (without external load) is flat within 1 db. from 7 to 2,000 cps. and flat within 3½ db. between 5 and 5,000 cps., according to manufacturer. The new wide-band shaker will operate from single frequency, complex waveform, or sweep cycling inputs. **Calidyne Co., 120 Cross St., Winchester, Mass.**

● Universal counter-timer, Model DS-7100, provides a direct digital read-out with decimal point indicated. Operating range in frequency is from 10 cycles to 100 kc. and time intervals from 40 microseconds to 100,000 seconds with a period range of from 1 to 10,000 cycles. Time and period measurement are accurate to within 10 microseconds and frequency measurement to within 1 count ± crystal oscillabor stability, which is 1 part in one million. **Detectron Corp., North Hollywood, Calif.**



Panel Seal Is Locknut

New "Panseal" keeps moisture, dust and vapors out of toggle switches and seals up panel hole in which switch is mounted. Device consists of a silicone rubber seal with stainless steel insert and can be installed easily by substituting it for existing hexagonal nut which secures switch to panel. Panseal also serves as a locknut, reducing danger of loosening under vibration. Device reportedly exceeds requirements of MIL-B-5423 and can be operated a −60C to 200C temperatures. Panseal, Inc., 10 Main St., Little Ferry, N. J.

FILTER CENTER

▶ **World's Smallest Digital Computer?**—Watch for Litton Industries to announce a new low-cost digital differential analyzer only slightly larger than an electric typewriter. The new midget 20-integrator Litton 20 reportedly will sell for less than $10,000 with manual input and scope output. If curve follower or punch-tape input and graph plotter or electric typewriter output equipment are included, price would be around $15,000. Litton's address: 336 No. Foothill Rd., Beverly Hills.

▶ **New RTCA Members**—Three new members have been elected to the Radio Technical Commission for Aeronautics, bringing RTCA membership to 120. They are:

- **Flight Safety, Inc.,** Flushing, N. Y.
- **F-R Machine Works,** Woodside, N. Y.
- **Western Union Telegraph Co.,** New York, N. Y.

systems engineers

SALARIES OPEN

Openings for experienced engineers to develop theory, formulation, and physical form of airborne weapon and navigation systems. Must have technical background in mathematics, physics or engineering. Will work directly with analog and digital computer design engineers, math analysts, and customer contacts.

AIRBORNE WEAPON SYSTEMS:

REQUIREMENTS: Experience in airborne fire control systems; interest in development of theory and fundamentals of air-to-air and air-to-ground weapon and control systems.

DUTIES: Study and development of specific systems, including initial theory and formulation (i.e., ballistic theory, fire control theory, bombing theory), radar studies, weapon studies, and preparing system proposals and recommendations.

AIRBORNE NAVIGATION SYSTEMS:

REQUIREMENTS: Experience in navigation or autopilot systems; interest in development of the theory and fundamentals of automatic navigation systems and control systems.

DUTIES: Study and development of specific systems, including initial theory and formulation, radar studies, star system studies, flight characteristic studies, and preparation of system proposals and recommendations.

Write or call Mac McKeague, Personnel Mgr., Librascope, Inc.

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Martin 404
Combination Air Valve and Reading Light Panel as installed in Lockheed Super Constellation 1049

WEMAC AIR VALVES provide a wide range of angular adjustments to control airstream direction and rate of flow by rotation of nozzle. Air leakage and weight are held to a minimum (tested 100% to aircraft specifications). Made of metal and/or plastic. Plastic can be colored to match or contrast with cabin decor.

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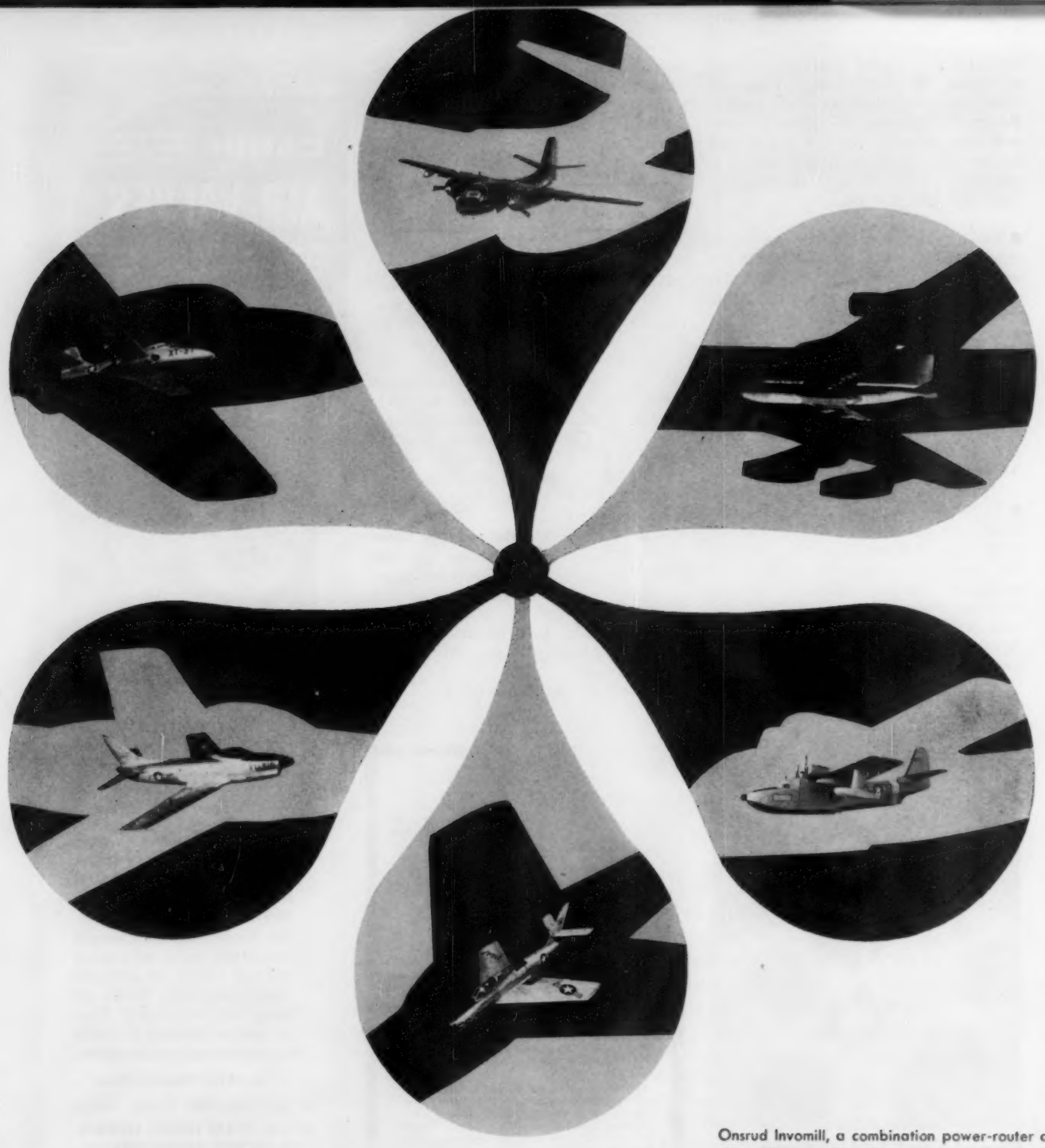


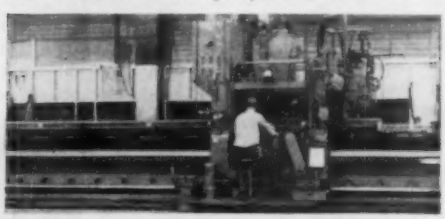
*Shape of things that come – *from* TWIN COACH

Piston or jet..single or multi-engine...trainer...interceptor, triphibian or tanker transport —Twin Coach Aircraft Division is probably unique among America's great subcontractors in its ability to produce major assemblies for many different aircraft types.

That's because we're *aircraft* specialists. Twin Coach Aircraft Division's five plants are devoted *exclusively* to production of airframe major assemblies. We build no other products...do no other work.

This is important because it means your airframe assemblies are built by experienced aircraft specialists... *men whose one aim is to produce to specification, on schedule, at the lowest possible cost.*

Onsrud Invomill, a combination power-router and skin-milling machine that can remove up to 150 cu. in. aluminum per minute, is just one of many hundreds of modern, high-speed machines. AA-1639



TWIN COACH COMPANY
Aircraft Division
BUFFALO, N. Y.

Other divisions of Twin Coach Company make:
PONY EXPRESS TRUCKS • FAGEOL GASOLINE AND PROPANE ENGINES
• FAGEOL-LEYLAND DIESEL ENGINES • FAGEOL AEROJET ENGINES

WHAT'S NEW

Telling the Market

"Questions and Answers on Electron Microscopes", eight-page booklet available from Research and Control Instruments Div., North American Philips Co., Inc., 750 S. Fulton Ave., Mount Vernon, N. Y. Also available from the company: Data on **pocket battery monitor PW 4010,** a folder, and design data on **flame photometer, type 12130,** a folder . . . **Control components for industrial use,** circular 1843, Automatic Electric Sales Corp., 1033 W. Van Buren St., Chicago 7, Ill.

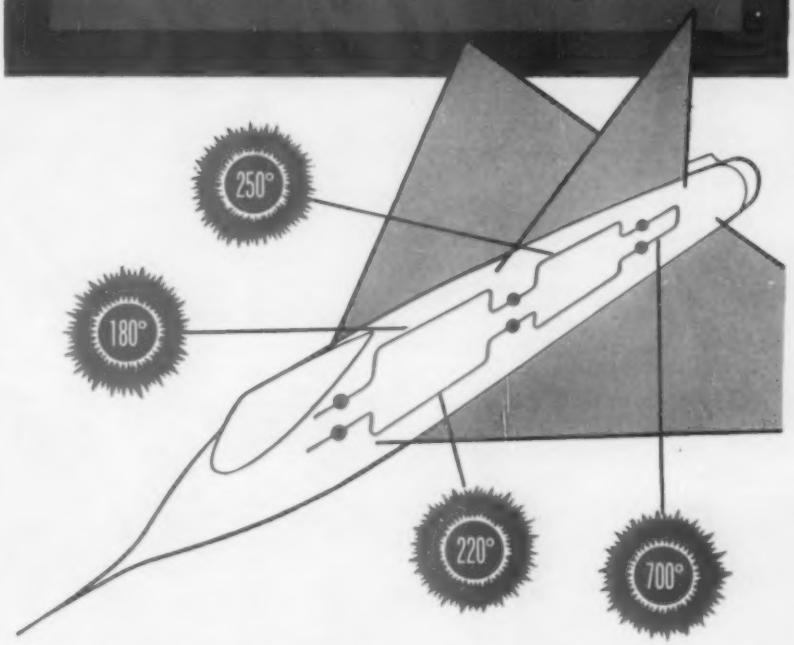
Automatic heater cycling control for Aero Commander, bulletin F 7221, Barber-Colman Co., 1400 Rock St., Rockford, Ill. . . . **"Vidigage" ultrasonic resonance thickness gage,** a folder, Branson Instruments, Inc., 430 Fairfield Ave., Stamford, Conn. . . . **Hermetic seals** produced by the Advac metallizing process, bulletin, Advanced Vacuum Products Inc., 18 Liberty St., Stamford, Conn.

Venturi insert nozzle, model NZIF, for main line metering, Bulletin 130-K3A, Builders-Providence, Inc., 345 Harris Ave., Providence, R. I. . . . **Small 2-circuit limit switch,** Preliminary Data Sheet 104. Also, **double-pole double-throw environment free switch,** Preliminary Data Sheet 105, **Micro Switch Division of Minneapolis-Honeywell Regulator Co., Freeport, Ill. . . . Shrink-fit assembly of metal parts,** metal treatment through chilling, gas dehydration and metal and material testing, catalog, Cincinnati Sub-Zero Products, Reading Rd. at Paddock, Cincinnati 29, Ohio.

Impact-O-Graph used in packaging, transportation, preventive maintenance and quality control, folder, Impact-O-Graph Corp., 1900 Euclid Ave., Cleveland, Ohio. . . . **New complete line of hoists,** bulletins H-37, H-38, H-39, P&H Hoist Division, Harnischfeger Corp., Milwaukee 46, Wis. . . . **Magnetic amplifier tubeless regulated d.c. power supply,** bulletin, Perkin Engineering Corp., 345 Kansas St., El Segundo, Calif.

Precision hydraulic and pneumatic aircraft components makers' data sheet on Series 1100 **lightweight restrictor valves** for 3,000-psi. hydraulic service, Aircraft Products Co., 300 Church Road, Bridgeport, Pa. . . . **Carbide blanks** for mechanically held tools, publication GT-292, Carboloy Dept., General Electric Co., Detroit, Mich. . . . **Foamite fire extinguishing equipment,** booklet, American LaFrance Corp., Elmira, N. Y.

An Edison First!
Separate alarm points in a single circuit
with a continuous coaxial cable fire detection system



EDISON was first to offer a fire detection system allowing sensing cables having different temperature alarm points to be series-connected in the same circuit. Developed in the world-famous EDISON Laboratory, the system permits a single loop to protect a number of areas varying in temperature—with a single control unit.

Exclusive spring clips and the single flexible sensing cable assure simple installation even in irregular and inaccessible areas. Other features include:

- **rapid response** — responds repeatedly to fire exposure; signals "Fire Out" automatically.
- **low impedance operating principle**—eliminates possibility of false alarms due to moisture or capacitive effects.
- **uses direct current** — 28 volts d.c. without amplifiers of any kind.
- **vibration and shock resistance**— the sensing cable has no moving parts to get out of order.

Write now for further details on this superior fire detection system . . . designed for today's high-speed, high-performance aircraft.

Thomas A Edison

A GREAT NAME CONTINUES GREAT NEW ACHIEVEMENTS

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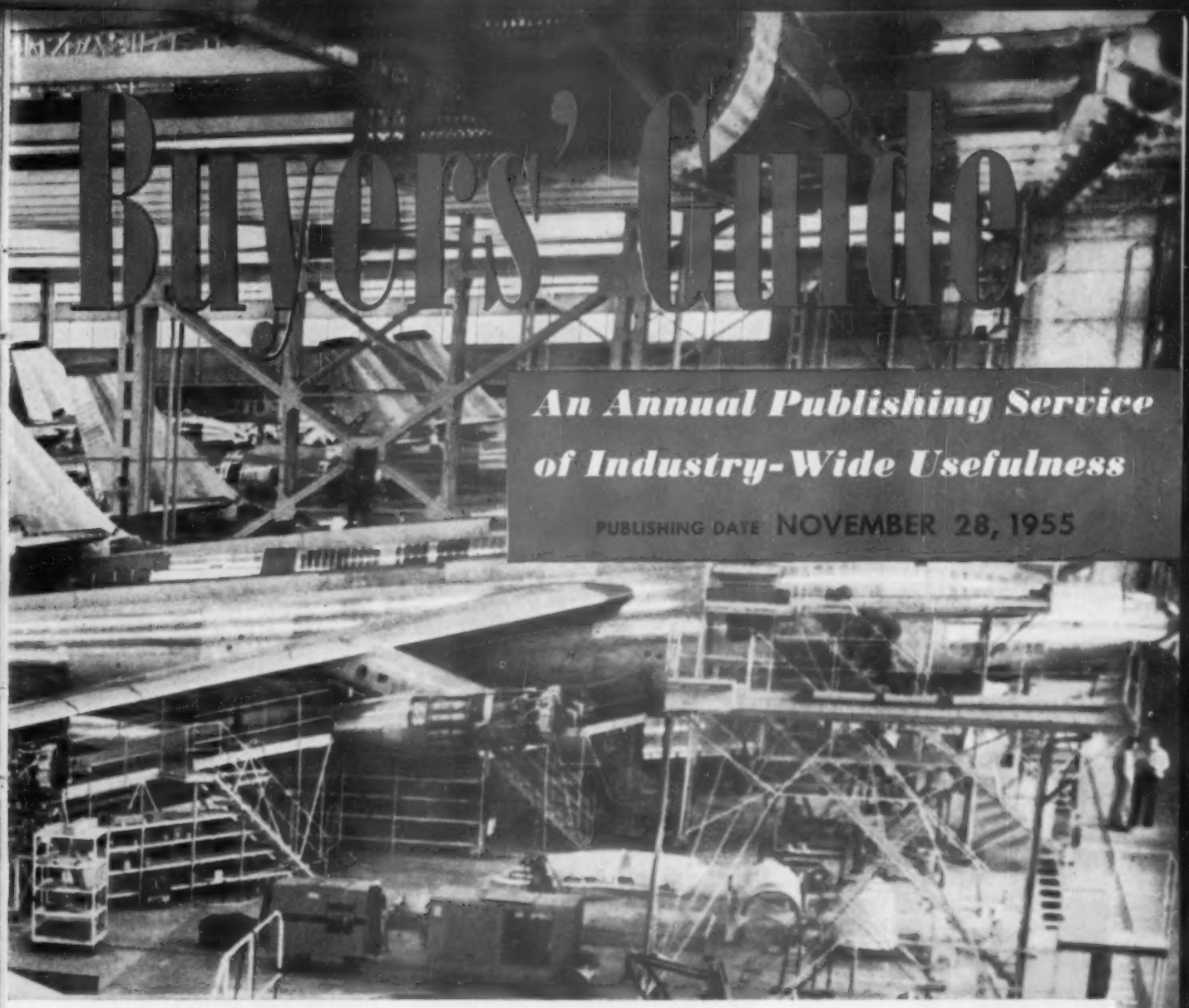
- **INDUSTRY-DEEP** Penetration Through Aviation Publishing's Largest Circulation

- **KEY** to the Major Buying Influences in the Multi-Billion Dollar Aviation Market

November 28, 1955, an all-important, needed publishing service will be available to the aviation industry . . . AVIATION WEEK's Annual BUYERS' GUIDE. The dramatic development of aviation into today's multi-billion dollar giant—reaching into all phases of manufacturing—demanding a constant flow of products and materials from tens of thousands of separate suppliers—has made a comprehensive, complete source book of suppliers and manufacturers a must for all segments of the Industry. AVIATION WEEK's BUYERS' GUIDE answers this intelligence need with an information service of year-'round usefulness, placed directly into the hands of some *57,000 key aviation engineers, management men, design and purchasing personnel—men who make up aviation's real buying influences . . . in the industry itself, in the Air Force, and throughout the Government.

The latest developments in military procurement will be covered in a special report. Included in the detailed information to be presented will be: Air Material Command—Air Research and Development Command buying practices, personnel listings—by name, procurement centers, etc.; All-inclusive listings of manufacturers of aeronautical and allied products, sectionalized for maximum utility under six major headings: **Aircraft;** Airframe and components, Armament, Fixed Equipment, Landing Gear, Powerplant. **Missiles;** Airframe and components, Equipment, including ground-handling, Powerplant. **Avionics;** Communications systems and equipment, Radar-fire control systems and equipment, Instrumentation and controls, Navigation systems and equipment, Components and devices, Test equipment, Computers and data processing equipment in airborne, ground-based or shipboard applications. **Supporting Groups;** Data systems, Electrical, Ground equip-



Buyers' Guide

An Annual Publishing Service of Industry-Wide Usefulness

PUBLISHING DATE NOVEMBER 28, 1955

ment, Hardware, Hydraulics, Instrumentation, Materials—including fuels, plastics, and chemicals, Tooling. **Nuclear Power Systems;** Accessories and components, Design services, Reactor fabrication. **Airlines and Airports;** Scheduled carriers, Non-scheduled carriers, Cargo carriers, Ground equipment, Lighting.

Indexing is set up to provide quick, easily referred-to locators for all products. In addition, advertisements and product listings will be keyed to each other for ready reference. AVIATION WEEK's BUYERS' GUIDE also will carry Trade Name and Distributor listings—making this publication **the most complete single source of buying information available to the aviation industry today.**

Every AVIATION WEEK subscriber will receive the BUYERS' GUIDE. That's a market of some *57,000 key aviation people . . . plus substantial bonus circulation through the sale of extra copies of the BUYERS' GUIDE to aviation companies and government agencies (Price for additional copies is $3.00 each). AVIATION WEEK's BUYERS' GUIDE will be read, referred to, and depended upon constantly wherever aviation business is transacted.

Be sure your complete line of products and services is listed in this basic book of buying information. Special discounts are offered for multipage and catalog-type advertisements. Your AVIATION WEEK representative will gladly help you plan your advertising to make the most economical and resultful use of the GUIDE. Call him today.

* Average net paid circulation, 51,893 (June, 1955 ABC Statement). Paid circulation of current weekly issues more than 53,000. Current weekly print order exceeds 57,000.

AVIATION WEEK

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ABC

SILASTIC Insulation Protects "Nerve System" of Jet Aircraft at Temperatures from −80 F to +400 F!

Here's another way Silastic protects wiring systems . . . Silastic-covered clips secure lines and protect them against heat and vibration. Easily installed or removed, these clips keep a firm grip at extreme temperatures without losing their vibration-absorbing resilience.

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Silastic offers corona resistance far superior to that of any other kind of rubber. Its dielectric properties, including dielectric strength and dissipation factor, show no appreciable change at temperatures ranging from —80 F to +400 F. Long exposure to moisture condensing or humid conditions causes no appreciable change in its mechanical, physical or dielectric properties. Moreover, *Silastic* contains no nutrient to support the growth of fungus. *Auto-Lite* 350 can be easily code marked and soldered without melting the insulation. And "350" actually costs less than high temperature wire previously available!

That's typical of the way *Silastic* serves the aircraft industry wherever rubbery properties are needed at extreme temperatures.

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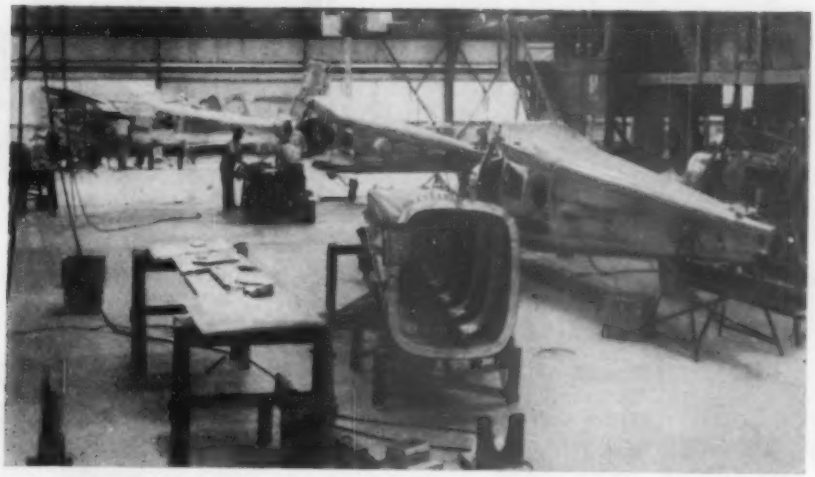

HELIO COURIER production line at Kansas plant of Mid States Manufacturing Co.

Licensee Plans Big Courier Output

The Mid States Manufacturing Co., of Pittsburg, Kan., has announced plans for the production of 50 four-place Helio Courier business planes by the end of 1955 and for an early-1956 output of two planes a week as the Helio company's manufacturing licensee.

Mid States already has made some initial deliveries of the new plane to Courier distributors, six of which have been signed by the Helio Aircraft Corp., of Norwood, Mass. Helio also is negotiating for foreign dealers for the Courier.

Full-scale production of the spin-proof, stall-proof Courier began approximately a year after the airplane was certificated by Civil Aeronautics Administration (AW, July 12, 1954, p. 21). After certification, the company sold a half-dozen Couriers to provide field experience prior to setting up a production line.

Only minor changes have been found necessary as a result of these service trials, the company reports. Items corrected included the elimination of some vibration in the cabin area, the improvement of the geared 260-hp. Lycoming at low flying speeds and of the cabin ventilation and the relocation of the pitot tube which had been vulnerable to damage while the plane was parked.

Because of firm orders now on the books, the earliest delivery dates now open are after December.

Priced at $24,500, the Courier is a development of a "safe plane" design by Prof. Otto C. Koppen of Massachusetts Institute of Technology. It features a cruise speed of 157 mph. and can fly at approximately 30 mph. fully loaded. Large slats and flaps aid control at low speeds. The plane can take off in 75 yd. fully loaded in still air. Cabin area is designed to take heavy impact loads.

Another Helio licensee, Fleet Manufacturing, Ltd., has received Canadian approval for operation of the Courier on skis. The parent firm is currently running tests on a Courier fitted with Edo floats.

Custom Twin Beech Conversion Offered

The conversion of Beech 18s into custom-built planes should figure prominently in the future of Remmert-Werner Manufacturing, Inc., a specialist in remodeling business aircraft. Headquarters is at Lambert Field, St. Louis, Mo.

The company already has sold three of its "Custom 18" Twin Beeches. Some half-dozen more customers have indicated that they will want similar conversions early next year.

Its new "Custom 18" is being fitted into the company's plans for a standard line of conversions which were initiated with the DC-3. Remmert-Werner has sold about 150 of the latter based on a book of standards that permits any one of its three overhaul and conversion centers to turn out identical aircraft.

R-W has its eye on the approximately 300 Twin Beechcrafts that are pending disposal by USAF as surplus (AW May 16, p. 20). Sale is awaiting a report by Commerce Department on the possible market effect of releasing these aircraft to civilians.

The plane features a lengthened cabin resulting from removal of the rear bulkhead and new windows that are of 16% greater area. The cabin is equipped with Remmert-Werner reclining passenger seats having retractable head rests. Entrance to the cockpit has been enlarged by removing the standard separation and using "accordion"-type entry panels.

If the customer furnishes a Beech 18 for conversion, R-W will remodel it to the new interior configuration in approximately 30 days at a cost of $15,000. The conversion firm will sell a "Custom 18" with zero-time airframe and engines for about $60,000. A prototype "Custom 18" has been on a nation-wide demonstration tour with Herman "Skip" Hugo, R-W sales manager.

PRIVATE LINES

Safe Flight speed control and lift-measuring instruments will be distributed by Denver Airplane Supply, Stapelton Airfield, Colo., which services uranium hunting planes. The instruments are expected to be particularly useful for the low-speed flying done in this aerial prospecting.

Two Learstar business transports have been purchased by U. S. Steel Corp. and another has been bought by Burroughs Corp., Detroit, Mich.

Three Sikorsky S-55s have been delivered to Humble Oil & Refining Co., Houston, Tex., for use in offshore drilling operations in the Gulf of Mexico, bringing to 10 the number of S-55s operated by firms in the area. Humble's copters will be maintained and operated by Rotor-Aides, Calif.

Civil aircraft shipments by airframe weight totaled 1,139,000 lb. in May, covering 486 airplanes valued at $31.8 million. Unfilled orders for civil aircraft of 3,000 lb. and over totaled 344 in May, 30% over the backlog a year ago.

Business plane shipments by six companies in June totaled 489 aircraft with dollar value of $6,994,000. Shipment by seven firms the previous month totaled 460 aircraft worth $6,701,000. June's figure includes 418 planes with

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"Good will" is the disposition of the pleased customer to return to the place where he has been well treated.
—U.S. Supreme Court

four or more seats and 71 one-and-two-placers. Six-month business plane totals: 2,474 aircraft valued at $36,148,000.

New travel insurance plan for air taxi and charter operators provides passenger coverage costing less in some cases than policies at airline machines, the underwriter reports. Premium on $10,000 insurance for 150-mi. flight would be about ten cents per passenger. Coverage is on a seat basis, a single policy covering all the operator's charter or taxi aircraft. Premium is based on number of flying hours. Policies are issued by Airway Underwriters, Inc., Ann Arbor, Mich.

Fletcher Aircraft Corp., Rosemead, Calif., plans immediate production of 50 additional FU-24 utility aircraft following certification by CAA for agricultural, passenger and cargo carrying. Firm has delivered more than 50 FU-24s to New Zealand for agricultural work on an order of 100 placed by Cable-Price Corp., Auckland. Operating as a Type III passenger-carrying aircraft, it can lift 1,250 lb. from an unimproved airstrip. One version of the plane is a six-place personnel carrier. Powered by a 225-hp. Continental, the FU-24 is priced at $24,920.

Lockheed Aircraft Corp. has purchased three Beech Twin Bonanzas from Norman Larson Co., distributor for Southern California and Nevada. Lockheed will use the planes to ferry employes on special assignments. The new aircraft replace two Beech Bonanzas used on these missions.

West German Firm Building Lightplane

Bonn—Germany's first postwar aircraft maker has started production in Duisburg-Ruhrort.

Prof. W. Blume, former chief construction engineer for the old Arado Aircraft Works at Brandenburg-Havel, and a staff of 40 other aircraft production specialists have set up the new organization, Ingenieur Buero fuer Leichtbau und Stroemungstechnik (Engineering Office for Light Construction and Flow Technique).

The first aircraft, slated for test early next year, is the B1-502. It will be an all-metal four-seater, powered by a 150-hp. Lycoming engine. Performance will be: top speed, 150 mph.; cruise, 132 mph.; climb rate, 925 fpm.; top altitude, 17,000 ft.; range, 625 miles and 4.85 hr.; landing speed, about 50 mph.

A second Blume plane will be the B1-501, similar to the 502, except that it will carry a 125-hp. Lycoming engine. Both ships will sell for from $9,500 to $11,900.

NEW 560A AERO COMMANDER features a 10-in. extension of the fuselage ahead of the wings, providing additional cabin area, and revised powerplant nacelles that enclose the engine exhaust augmentor tubes for additional streamlining. The longer cabin allows greater flexibility in interior arrangements and more leg room than was available in the earlier 560. Two Lycoming dry-sump GO-480-D1A engines of 275 hp. each give the 560A a top speed of 211 mph. and optimum cruise of 204. Side-mounted accessories allow easier maintenance. New placement of the augmentor tubes has increased engine cooling efficiency 15%, Aero Design & Engineering Corp. reports. Initial deliveries include 15 for USAF, which turned over the first 560A to President Eisenhower to replace the leased 560 he had been using (AW July 25, p. 15). Civilian orders will be delivered at year's end. The new 560 is priced at $74,500 f.a.f., Bethany, Okla. Production now is at the rate of two weekly; will be stepped up to about 10 a month in a few weeks. Aero Commander plans to double its present production plant capacity and use the current facility for modification.

Engineering Versatility

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NEW AVIATION PRODUCTS

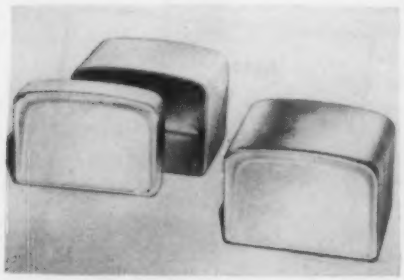
Compact Dynamic Pickup

Low-range pressure transducer measures gage or differential pressure in ranges to 0.05 and to 1.00 psi.

Pickup consists of 1⅞ in. diameter beryllium-copper bellows fastened to a rigid pickup case and connected to a strain-sensitive resistance bridge. It employs an unbonded strain-gage sensing element weighing 4 grams, available for a.c. or d.c. excitation voltages of 6, 12 or 15 volts, for bridge resistances of 350, 600 or 800 ohms and minimum full scale outputs of 20, 40 or 50 millivolts respectively. Resolution is 0.02% of full scale.

Dynamic pickup output signals are large enough to be used directly without amplification.

Dynamic Instrument Co., Inc., 28 Carleton St., Cambridge, Mass.



Drawn Cases for Avionics

Drawn aluminum instrument cases for electronic and instrument manufacturers have recessed covers to protect knobs and dials to be installed, and have four dimples on the bottom. The ZIC-2 is 11 in. wide, 7¾ in. high with a depth varying from 4 to 8¼ in.

Two more standard cases will be tooled, one smaller and one larger than the ZIC-2.

Zero Manufacturing Co., 1121 Chestnut St., Burbank, Calif.

Jet Pressure-Ratio Indicator

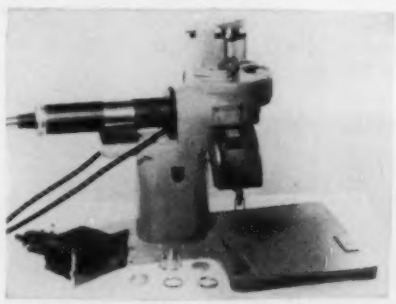
Pressure-ratio indicating system for turbojet engines consists of a transducer and indicating unit. The transducer is a torque balance mechanism utilizing a symmetrical floating plate.

Output of the system is a shaft rotation proportional to the ratio of engine discharge to engine inlet pressure, which positions a synchro transmitter.

Hermetically sealed indicator unit consists of one synchro receiver and two pointers—the large pointer makes approximately ¾ revolution and the small pointer makes one revolution for each 0.1 pressure ratio.

Manufacturer claims an overall accuracy of better than ± 0.02 pressure ratio under all conditions. Transducers are available in pressure ratio ranges of 1.2 to 3.4 and 1.0 to 4.0. Indicators can attain full-scale deflection in five seconds.

Instrument and Systems Div., Norden-Ketay Corp., Wiley St., Milford, Conn.



X-Ray Spectrograph

Inverted spectrograph, used for analysis of metals, powders and liquids, has three specimen holders measuring 1⅜ in. diameter by 1⅛ in. deep.

Holders fit into horizontal disk rotating inside leaded-bronze X-ray-proof housing. Specimen holders have ¼-mil thick Mylar windows held in place with retaining rings. Nickel foil collimator with ⅛-in. spacing is built into instrument.

Spectrograph can be used with X-ray tube.

North American Philips Co., Inc., Mount Vernon, N. Y.

British Takeoff Monitor

Newly developed takeoff monitor will be shown at Society of British Aircraft Constructors Exhibition at Farnborough in September.

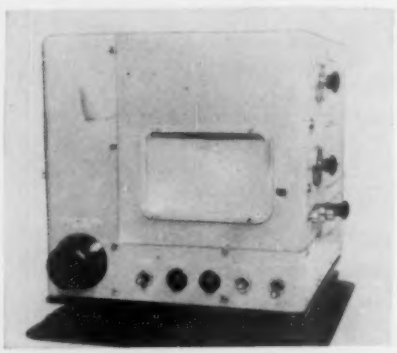
The monitor indicates relation between airspeed and acceleration at all times during takeoff run and shows whether acceleration is above or below value needed to make good the takeoff velocity in normal distance. Any departure from normal conditions is shown to the pilot early enough for corrective action, the maker reports.

Canadian Marconi Co., 2442 Trenton Ave., Montreal 16, Canada.

Miniature Pressure Switch

Miniature vibration-resistant differential and gage pressure switch for use in aircraft and missile systems weighs approximately ½ lb. The switch operates in inert gases and fluids, engine and hydraulic oils and aromatic fuels. It withstands vibration up to 35G. Operating temperatures range from −65 to 165F.

Southwestern Industries, 5880 Centinela Ave., Los Angeles 45, Calif.



Airborne Temperature Recorder

Model R1021-D high-speed airborne temperature recorder, 10x10x10 in. and weighing 40 lb., is a 210-channel fixed stylus recorder designed for use in flight testing of aircraft.

The device writes directly on electrosensitive paper, records from up to 5 hr., has a voice channel and provides instantaneous visual readout.

High-frequency response using either 60 or 400-cycle, 115-v. input power offers 212 on-off channels of analog, digital and sequential data recording on a 5-in. chart.

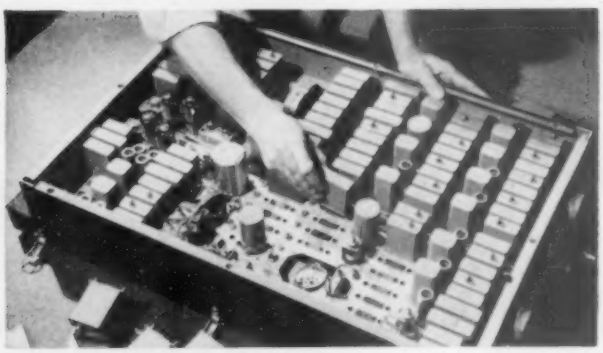
Radiation Inc., Melbourne, Fla.

Meet Your Air Arm Man With The Facts, R. L. Hale

Dick Hale serves the New York and New England areas. Through Dick*, or one of his counterparts in your area, you can get all the facts on bomber defensive systems . . . part of the Air Arm systems family. Right now, Dick Hale wants to tell you why these Westinghouse tail turret systems can be counted on to score a . . .

Bull's-Eye!

Here are some of the important FACTS behind these systems:



MAGAMPS, potted units and sealed components are used extensively in Westinghouse bomber defense systems. They stand up under rugged conditions, give *extra* reliability to system operation.

Air Arm is turning out production systems in quantity and has been delivering on schedule from its large modern plant ideally located next to Friendship International Airport in Baltimore, Md.

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**Dick Hale can be contacted at 40 Wall St., New York 5, N.Y., Phone: Whitehall 3-4321.*

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This defense of high-performance aircraft, like the Douglas A3D Skywarrior, against tail attackers requires instantaneous, pin-point accuracy *plus* reliability in every component of the complex radar and fire control equipment.

Air Arm radar uses high-speed sequential lobing and high-performance servos, resulting in excellent tracking accuracy. Computer reliability is enhanced by the use of MAGAMP* magnetic amplifiers and potted units . . . all adding up to more than sufficient capability to down the fastest moving enemy aircraft.

Since 1946, Westinghouse has been developing, designing, testing, and *building* bomber defense systems, the latest features of which are still classified. Current production systems are being turned out in quantity for the armed forces, and on-schedule deliveries have been made for more than a year.

At the same time, parallel engineering development is constantly advancing the state of the art, working hand in hand with aircraft manufacturers and the military — to help you bring Tomorrow's Aircraft . . . One Step Closer. Westinghouse Electric Corp., Air Arm Division, Friendship International Airport, Baltimore 27, Md.

*Trade-Mark

J-91026-B

On the Air Arm firing range, Armorer C. E. Brust, Jr., Test Supervisor Norman Brown, and Electrical Tester W. C. Scheele check over a typical burst pattern—evidence of accuracy backing up the fine reputation these systems have gained.

THE AIR ARM SYSTEMS FAMILY

Fighter Armament	**Bomber Defense**	**Flight Control**
Missile Guidance	**Special Purpose**	**Systems Components**

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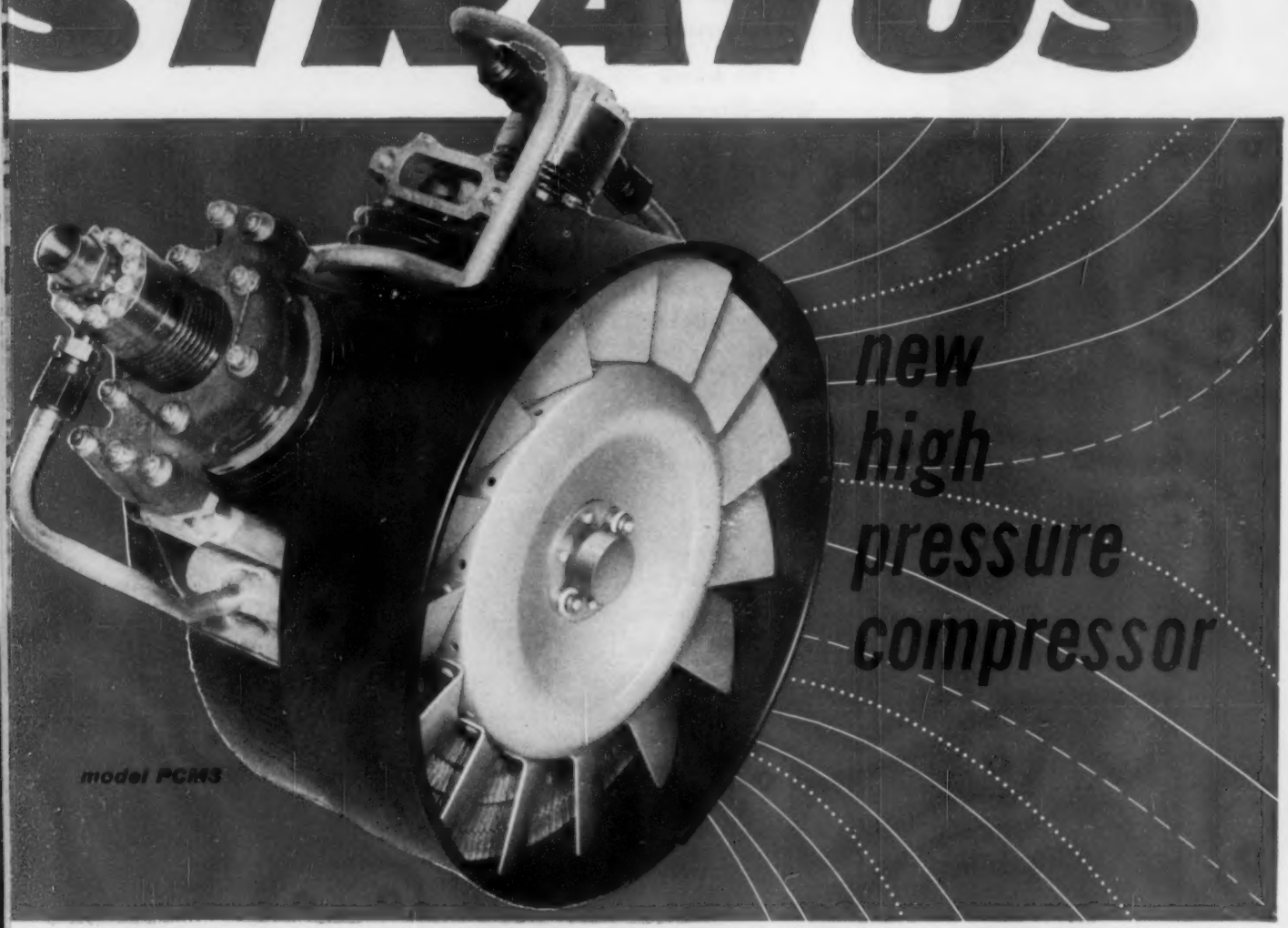

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The PCM3 is designed to make available high pressure air — 3000 psi — in volume not heretofore obtainable. It will deliver full-rated volume at full-rated pressure to any aircraft's maximum altitude.

It delivers 11.2 cfm at 3000 psig discharge and 14.7 psia intake. With pressurized intake it can deliver higher volumes and maintain full 3000 psig discharge flow to any altitude with no fall off. Operates on either free air or engine bleed.

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Operates at High Ambient Temp. — Self Cooled
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Magnesium pallet dollies feature extruded magnesium frames, phenolic resin rollers, tilt construction, rounded side rollers and heavy roller bearings. Capacities range to 4,000 lb.–Magnesium Company of America, Materials Handling Division, E. Chicago, Ind.

Dual-Lock structural fastener is adaptable to aircraft cowlings and guided missile assemblies. It employs double acting take-up for heavy closing pressure and provides pressure-tight seal when gaskets are used–Simmons Fastener Corp., 1700 N. Broadway, Albany 1, N. Y.

Flourolin 202 non-corrosive lining combines chemical inertness of Kel-F with the mechanical rigidity of aluminum foil spread-coated with pressure-sensitive adhesive. – Joclin Manufacturing Co., North Haven, Conn.

Tool-holder has carbide pad for "throwaway" type carbide insert blanks, allowing cutting tools to operate with less overhang while providing greater rigidity.–Carboloy Dept., General Electric Co., Detroit, Mich.

MultiMaster electric fork truck, has 2,000-lb. capacity without counterweight, 4,000 lb. with.–Lewis-Shepard Products, Inc., Watertown, Mass.

Diaphragm control valve Series 400 can be used for steam, water, air and liquids in test cells and various component parts.–Minneapolis-Honeywell Regulator Co., Industrial Division, Philadelphia 44, Pa.

Ind-X portable laboratory enables field engineers and technicians to produce on-the-spot radiographs to check metal structures. Small kit processes exposed X-ray film. Unit can be used with any X-ray generator.–Ind-X Corp., Seattle, Wash.

Metallurgical microscope has over-sized focusing stage with interchangeable stage plates for transparent or opaque specimens. Available in molecular and binocular bodies.–Bausch & Lomb Optical Co., Rochester, N. Y.

Tachometer takeoff heads Series 32 cover speed ranges between 100 and 5,000 rpm. for full-scale readings. Interchangeability does not affect the accuracy of the Metron tachometer indicators.–Metron Instrument Co., 432 Lincoln St., Denver 3, Colo.

Tweco-Lite aluminum welding cable reportedly weighs about half as much as conventional copper welding cables. Available in Grade SR (synthetic rubber jacket) for normal use and in Grade N-60 (Neoprene jacket enforced with rayon braid) to take oil, heat, chemicals or rough usage.–Tweco Products Co., P.O. Box 666, Wichita 1, Kan.

Hydraulic control panel, applicable to all hydraulically operated precision boring, including standard and way-types, is said to provide faster rapid traverse for shorter machine cycle time; snubbing action for smooth deceleration from rapid traverse to feed or stop; higher feed rates for machining aluminum; complete single lever manual control; electric timer dwell control; constant feeds regardless of resistance and other features.–Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

Lifter and feeder magnetic hand tool picks up sheet steel and holds it securely for feeding operations. It uses no electricity or batteries and carries an unlimited magnet life guarantee. Magnetool Division of Multifinish Manufacturing Co., 26341 W. Eight Mile Rd., Detroit 19, Mich.

Byrnaperture hangar doors have cutouts to fit around plane fuselages, permitting hangar space savings. Apertures consist of movable segments of alumi-

Bendix-Skinner

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Hydraulic Complete filters, or elements only. Up to 14,000 p.s.i. burst, to 120 g.p.m., and filtration down to ½ micron*. Efficiency to 99.9%. (MS28720-4, -6, -8, -12; AN6235-1A, -2A, -3A, -4A; AN6236-1, -2, -3, etc.)

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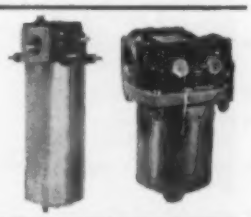

Air Instrument air and breather filter application to 10 c.f.m. Filtration for air-driven instruments and venting of hydraulic systems. (AN6240-1, AN5822-1, AN-6237-1, etc.)

*1 MICRON = .000039"

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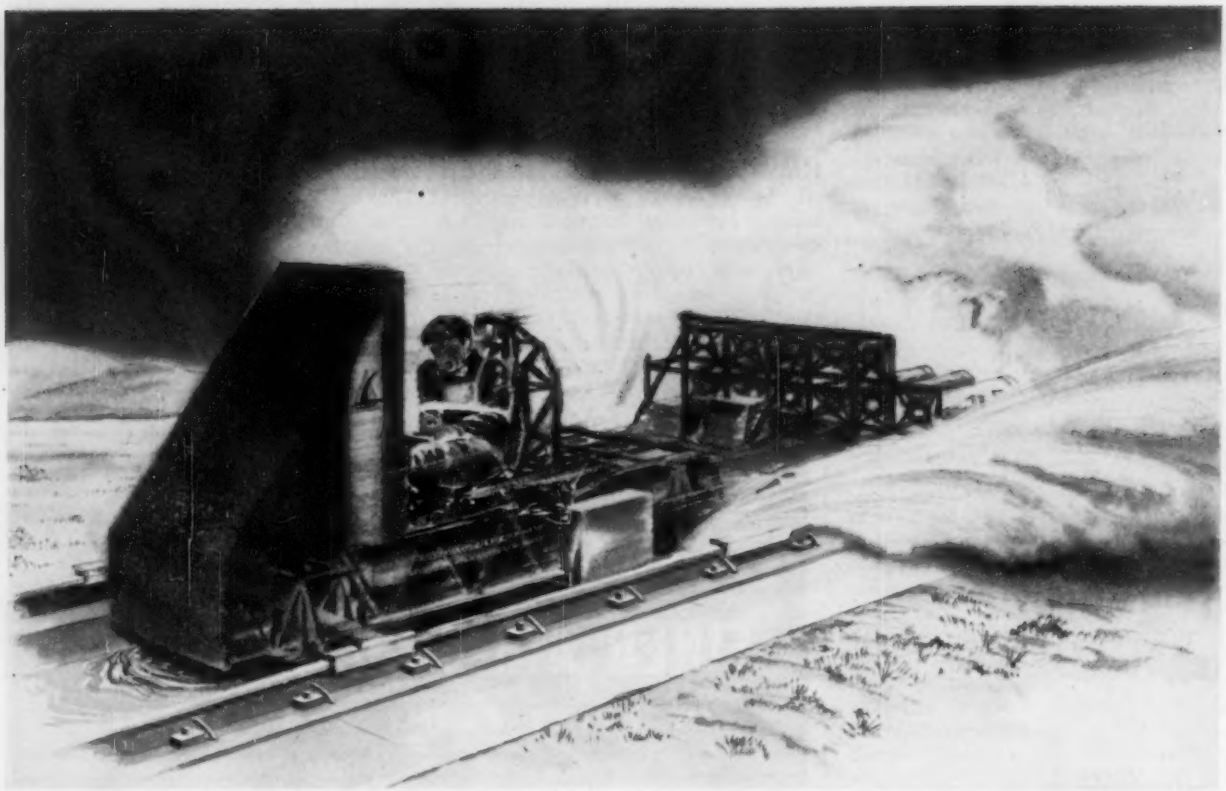

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AEROJET-GENERAL NEEDS:

Chemical Engineers
Chemists
Electronic Engineers
Mechanical Engineers
Physicists and
Aeronautical Engineers

The high degree of safety and reliability of Aerojet-General solid-propellant rocket powerplants has been demonstrated by their repeated use on manned test sleds. Shown here is the Northrop sled which received widespread attention during deceleration tests conducted at Holloman Air Development Center, with Lt. Col. John P. Stapp, USAF, subjecting himself to deceleration rates up to 35 G's!

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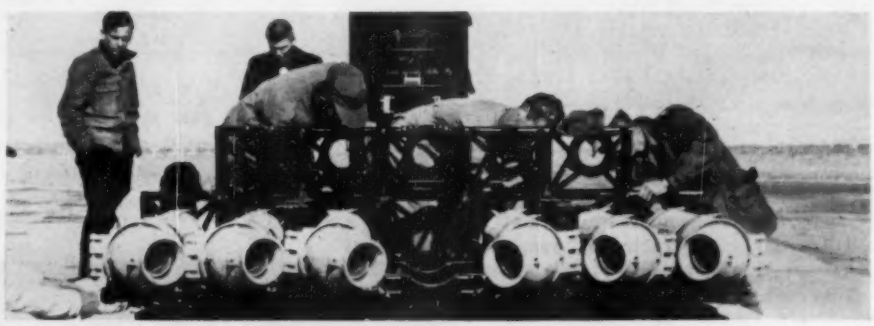

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4U-SD electric Impactool is standard-duty equipment, uses less power than firm's 5U unit, thus is smaller and lighter.–Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.

Hose reel eliminates hazards of loose, tangled hose lying around traffic lanes and plant work areas and can take hose up to 3 in. in diameter. Control is either by electric motor or hand rewind. –Clifford B. Hannay & Son, Inc., Westerlo, N. Y.

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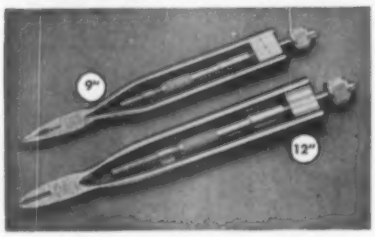

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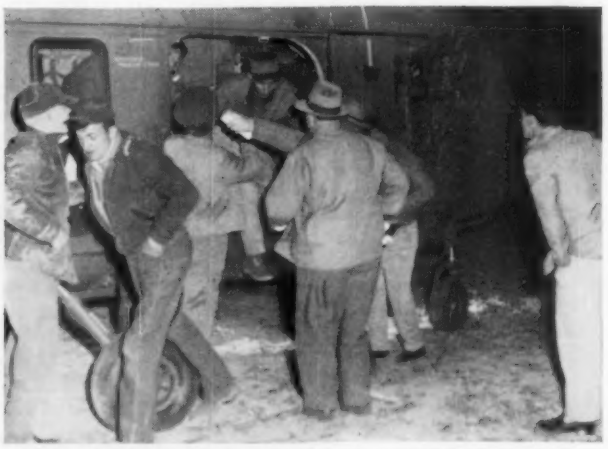

HELICOPTERS RESCUE 93—Two H-19 Sikorskys from the U. S. Air Force's Air Rescue Service last March rescued 93 men, women and children from a storm-swept South Carolina lake. They were stranded on sandbars and small islands when violent storms struck suddenly. The helicopters made more than 23 trips to bring the marooned people to safety on the mainland.

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High-production chucking lathe handles first and second operation work with a work diameter capacity up to 15 in. over front slide and up to 13 in. over rear slide. It features fully automatic cycle control of cutting tool movements and tracer control.—Monarch Machine Tool Co., Sidney, Ohio.

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The KC-135 is an advanced version of the Boeing prototype pictured above. This new craft, designed and built by Boeing to put America into the jet tanker-transport field, has performed beyond expectations. Back of its outstanding performance is Boeing's vast background of experience pioneering the B-47 and B-52 jet bombers—revolutionary planes that opened up the current era of large, multi-jet aircraft. The KC-135 benefits from Boeing's unique experience developing aerial refueling equipment and aircraft, including the building of more than 600 KC-97s.

Boeing's Seattle Division is now tooling up for KC-135 production. Already substantial subcontracts have been placed with companies from coast to coast for participation in the manufacture of this historic first fleet of jet tanker-transports. This is part of Boeing's policy of passing along to subcontractors and vendors up to 65 cents of every Air Force dollar contracted.

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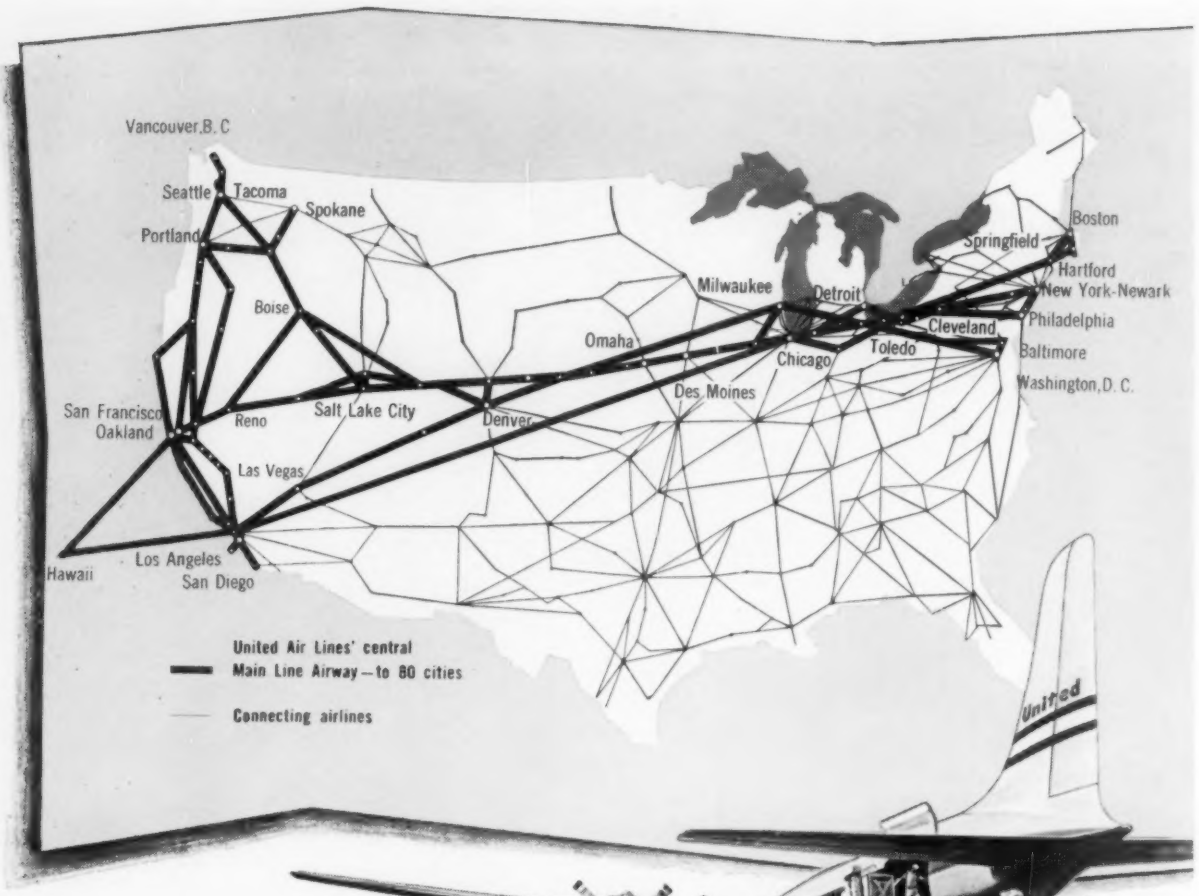

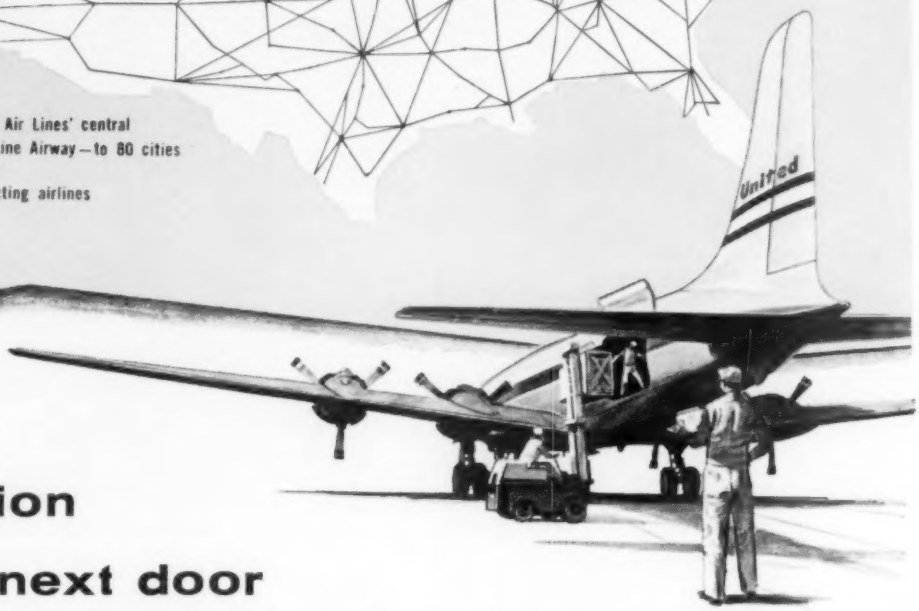

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Lufthansa Seeks Transports for Growth

By Gerald W. Schroder

Bonn—Lufthansa German Airlines, which on March 31 became an operative airline for the first time since 1944, is in the market for new transports which it hopes to place in service on present routes and still others now in the planning stage by late 1957. To do this, the carrier will have to decide upon specific models by the end of the year because of the average lag of between 20 and 24 months between order and delivery.

The leading contender thus far appears to be Lockheed Aircraft Corp.'s turboprop-powered Electra. The U.S. aircraft builder, which has sold the German line eight 1049G Super Constellations for trans-Atlantic service, is pushing the Electra in conferences with Lufthansa officials. The first flight of the Electra, however (AW June 27, p. 94), is scheduled for just about the same time Lufthansa wants deliveries.

LUFTHANSA'S trans-Atlantic hopes are pinned to Lockheed 1049G Super Connies.

Expansion Plans

Officials of the revived airline began moving towards expansion after the first period of operation gave them a chance to assess the results of years of paper planning.

With the four Convair 340s purchased after long consideration the carrier operates four flights a week to London, three to Paris and two to Madrid. On the trans-Atlantic route, four LH Super Constellations are making four roundtrips a week to New York.

When the other four 1049Gs are delivered next March, the carrier plans to extend its trans-Atlantic services to Rio de Janeiro, Sao Paulo and Buenos Aires via Dakar in Africa. Buenos Aires flights probably will be inaugurated via New York at a later date. Other plans include service to the Near East as far as Teheran.

Encouraging Verdict

In almost every instance, the company's decision on aircraft purchases has been encouraging.

Some German aviation observers said Lufthansa bought the wrong type of planes for its operations when it purchased Convair 340s for European routes and Super Constellations for trans-Atlantic service. "This is not true," carrier officials report. "We now know that we bought the right type of equipment at the right time to do a certain job."

Basic consideration in the choice of equipment was the airline's need for modern transports that had been proved in service. Second was economy of operation and adaptability to its routes.

With the first phase over, Lufthansa officials now are facing new decisions.

"The same old problems are right back in our lap," one executive said, "financing, where to get the capital, delivery terms, estimated future traffic loads, limited new routes—all these familiar problems will have to be solved all over again.

"When we bought our Convair 340s, a lot of people said we should have bought the (Vickers) Viscount. We disagreed then, and we feel our decision was right. But past experience with the Viscount by other lines is certainly very encouraging.

Transport Size?

"But the big question that we will have to solve is this: Do you stick to a small plane for short and medium hauls or can you utilize a larger type plane, say with 65 to 75 seats? We have closely watched American Airline's decision to get the Electra. Is this type of plane useable on short and medium European routes in contrast to the same type of route in the United States? We have to take into consideration the fact that European air traffic is apparently not growing at the same fast rate as U.S. traffic. Then why is BEA (British European Airways) asking for a larger Viscount with 65 to 75 seats, when they probably won't fill the plane all the time?

"These are basic questions we will have to solve before we make up our minds on what to purchase in the future."

With its present equipment, Lufthansa's air and ground crews have worked out a relatively smooth operation after the brief shakedown period.

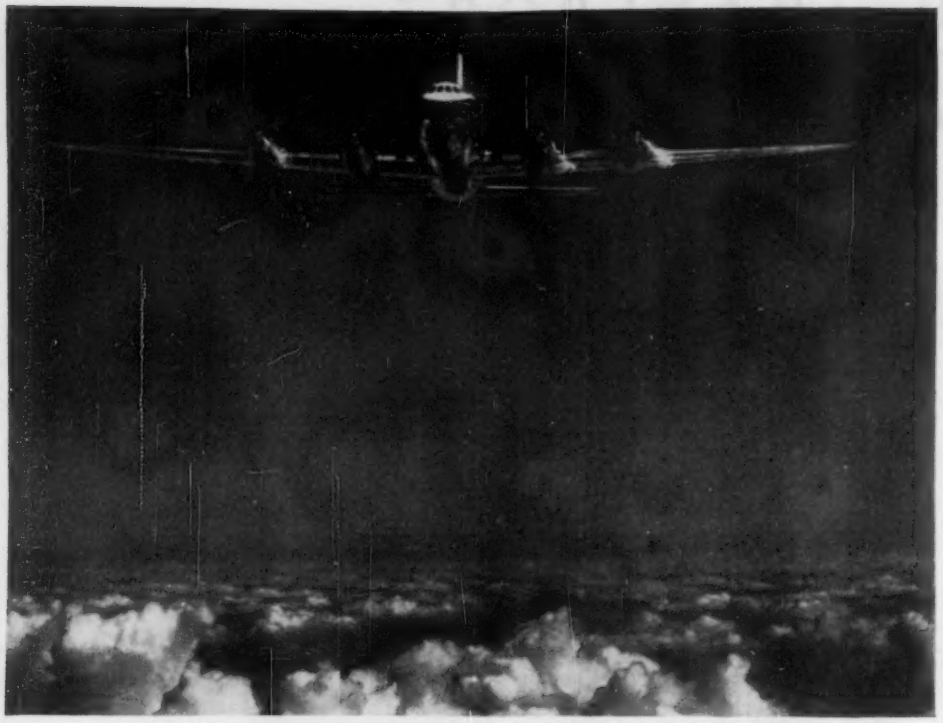
"Our people hardly ever discuss the Convair or the Super Connie. They are sure of both operations and maintenance," reports one LH director. "We have, of course, subjected these planes to substantial strain, especially the Super Constellation. It's one thing to take off from Hamburg and, hours later, land in New York. It's another thing to have to train pilots and crew and take off and land a dozen times in one day.

"Of the 1,120 hours our Super Connies had flown by July 10, 1955, 211 had been training hours only. Our personnel has never had progressive, continuous training in modern aircraft; this is in contrast to other lines whose personnel have grown with and into each new type to come from the assembly lines."

Pilot training for the Super Constellations has been completed both in California and in Hamburg. Lufthansa's men now fly as co-pilots, with Trans World Airlines personnel as chief pilots. Some Lockheed flight engineers still fly the trans-Atlantic route, but several LH flight engineers have been checked out by the Lockheed flight engineer stations in Hamburg.

Experienced Maintenance

The airline's centralized maintenance base is located in Hamburg and has grown into one of Europe's most up-to-date operations. Lufthansa hired a number of mechanics with years of experience with the U. S. Air Force, Royal Air Force and foreign airlines. In addition, some prewar Lufthansa mechanics rejoined the ranks of the new LH. The carrier now employs



Proving Trials for Britannia 100s

The Britannia 100 pictured above flying over a dense cloud formation and three sister ships manufactured thus far for the British Overseas Airways Corp. have logged a total of more than 1,900 hours in flight-development tests. Route proving trials for the four planes are scheduled to begin this month.

1,100 persons in Hamburg, 400 of them on maintenance jobs.

Maintenance in Hamburg is run by a cadre of mechanics trained by KLM Royal Dutch Airlines in Amsterdam. One group of 13 men were trained by KLM for Convairs; another group of 14 were checked out on Super Constellations. The Dutch line was chosen for this training because it operates both types of transports.

Some 24 LH engineers also went through KLM courses and now are qualified to teach at the Hamburg base.

Luftwaffe Pilots

Pilot training started in November 1953 when four Lufthansa pilots began classroom courses in Cologne. These men, and a second group, were then trained in England and received British commercial pilots licenses.

These two groups were then sent to Oakland, Calif., to adapt themselves to U. S. standards.

By the summer of 1956, the airline estimates it will need around 136 trained pilots. Almost all will be prewar or wartime Luftwaffe pilots. The supply of former Lufthansa pilots still capable of serving apparently has been exhausted, and the carrier estimates that it requires two and a half years to train a novice, thus the heavy emphasis on former German military pilots.

Eighty-one pilots are getting additional training at Hamburg. Of these, 37 will receive airline transport pilots licenses and the other 44 will get commercial pilots licenses.

The Aviation Section of West Germany's Transport Ministry is working closely with Lufthansa on bilateral agreements needed to extend the airline's route network.

LH officials have studied closely reports of recent congressional hearings in the United States on the U. S.-German bilateral agreement. The company realizes that U. S. air carriers are concerned over whether the capacity clause of the Bermuda agreement is sufficient to keep the German carrier within reasonable bounds on its rights beyond New York to Latin America. But LH officers say they won't be in a position for several years to come to exploit routes, granted under the treaty, to Central and South America.

A similar British-German treaty, signed on July 22 in London, provides for service to London, Manchester, Glasgow and Edinburgh and for flights via Manchester to Dublin, the U. S. and Canada.

The German airline also gets rights to Central America via the Azores and Nassau. Hong Kong and Singapore can be used as intermediate points on routes to the Far East, Indonesia and Australia. In Africa, Germany will be granted landing rights in Nigeria for flights to the Union of South Africa. U. K. carriers obtained rights to use airports in the Federal Republic for routes to Scandinavia, South Eastern Europe, the Near and Far East and to West and South Africa.

Aside from the U. S. and the U. K., German authorities are now working out bilateral treaties with France, Belgium and Switzerland. Informal discussions have been started with Scandinavian nations, Iceland, Ireland, Finland, the Netherlands, Spain, Brazil and Australia.

Traffic Forecast

Lufthansa now is carrying 50% of capacity and hopes to increase this to 60% by next year. "We were unable to cash in on the peak east-bound business from America this year since we weren't able to start bookings until June," says one LH official. "We hope to pick up quite a bit on the westbound fall business this year, though."

The carrier hopes to be faster than other lines on Germany-U. S. routes since use of tip tanks will allow the line to skip Shannon and Gander.

On load factors, LH is banking heavily on increased freight and airmail business and hopes that German and U. S. postal authorities will agree on an increased LH share.

CAA Grounds Carriers

Civil Aeronautics Administration last week temporarily grounded two large irregular air carriers, Aero Finance Corp. and Peninsular Air Transport, charging numerous violations of regulations.

A 30-day emergency suspension of the operating rights of each of the Florida-based carriers was invoked Aug. 12 by CAA.

CAA also instituted a safety enforcement proceeding with the Civil Aeronautics Board by filing complaints alleging 37 counts of safety infractions against each carrier. Aero Finance and Peninsular have 10 days to answer the complaints and request a hearing in the case which has been assigned to CAB Safety Examiner J. C. Caldwell.

CAA charged both carriers with operating aircraft in excess of pilot flight-time limitations and with aircraft components which had exceeded the required inspection time limits. In addition, Peninsular was alleged to have operated aircraft in overloaded condition and Aero Finance was charged with operating with unqualified airmen.

The two carriers have been engaged in both common carriage and military charter work and have operated as Southeast Airlines. They are members of the Aircoach Transport Assn.

Mohawk Hopes to Replace DC-3s; Wants All-Convair 240 Operation

By Gordon Conley

Ithaca, N. Y.—Mohawk Airlines believes it will be able to reduce the annual operating costs of its three Convair 240s by at least $44,000. If the forecast is made good, the local service carrier plans to switch from DC-3s to an all-240 operation (AW Aug. 15, p. 123).

Mohawk is the first small airline to buy 240s and the second to make tentative plans for replacing its entire DC-3 fleet. Pioneer Air Lines tried to shift to Martin 2-0-2s in 1953 but was forced to sell the larger transports and return to DC-3s when the Civil Aeronautics Board refused to underwrite the program with increased subsidy.

Southwest Airways won CAB support last year for an operation that put three 2-0-2s on high-density West Coast routes and nine DC-3s on normal local service flights. Allegheny Airlines started a similar combination in the Middle Atlantic states this summer with four 2-0-2s and 14 DC-3s. Present plans for both SWA and Allegheny do not go beyond a mixed fleet.

Procedural Change

Mohawk expects to save its money through operational changes made when the airline inaugurated service with its 240s last month. These include:

• **Quick letdowns and climbs.** With the 240s' pressurized passenger cabin, the local service carrier can descend from 7,000 feet to Newark Airport at a rate of 1,000 feet per minute. This cuts approximately 18 minutes off the DC-3's letdown of 350 fpm.

Mohawk President Robert E. Peach says fast letdowns and climbs at Newark will save at least $18,000 in operational expenses during the Convair's first 12 months of service. His prediction allows for instrument conditions (IFR) during 40% of all 240 flights.

• **Single-engine stop.** The airline now shuts down only the right engine during enroute stops, reducing time at passenger loading gates to a maximum of three minutes. With one powerplant turning over, Mohawk also is able to eliminate auxiliary ground power units.

• **Rolling magneto checks.** The carrier's flight crews are reducing delays at the end of runways and getting into the air faster by checking magnetos while plane is taxiing.

• **Carry-on loading.** The local service line has eliminated mechanized loading equipment at the three-minute stops, finding it faster to roll luggage to the transport and handle manually.

Mohawk plans to get more passenger revenue out of its Convairs by increasing the transport's capacity from 40 to 44 seats. This compares with 28 seats in the DC-3.

Increased Advantage

"We're convinced there is a way to increase the 240's seating capacity without going to a high density (3-2) arrangement," says Peach. "But we want some more operating experience before we try anything."

One possible way to make this change, according to Mohawk studies, would be to eliminate the airliner's buffet in the rear of the fuselage and relocate lavatories to the forward section. The space would provide just enough room for four additional passengers.

The local service airline's biggest problems with the Convair-Liner are maintenance and the transport's landing load limitation.

During July, the first month of 240 operation, Mohawk completed only 88% of its Convair flights, compared with 99% for the DC-3s. Peach says the mechanical failures were due primarily to maintenance crews' lack of experience with the new equipment.

Because of breakdowns, the carrier's operating expenses will increase during July and August but are expected to decrease in September after maintenance personnel complete their shakedown period with the 240s.

Peach says the Convair's load limitation is very serious, although he believes his new aircraft is the best of the postwar short-haul transports.

"The similar limitation of the Martin 2-0-2 is so restrictive that, in our opinion, the 2-0-2 could not be operated economically over Mohawk's route system," he says.

"Our Convairs have a gross takeoff weight limit of 40,500 lb. Their maximum allowable landing weight, however, is only 38,600 lb. Mohawk's heaviest traffic loads are the 180- and 130-mile segments out of New York to Utica and Binghamton and an 80-mile segment between Utica and Albany on the Buffalo-to-Boston route. The average Convair burnoff of approximately 200 gallons per hour means that a 240 taking off at full gross must fly for an hour and 30 minutes before it can land.

"The plain fact is that Mohawk, by its certificate, is not permitted any such stage length.

"It appears that Mohawk is not only unable to use the full load carrying capacity of its Convair on its routes but, if it were to take advantage of expansion possibilities built into the airplane by the factory, it still would not lick the primary problem of being able to use the complete weight carrying capabilities of the modern postwar aircraft.

"In other words, the tendency of the aircraft manufacturer has been to convert the so-called short-haul transport into an intermediate-haul airliner instead of to make the short-haul transport carry more people between shorter-haul markets."

(This is the second of a three-part series on Mohawk Airlines.)

Air Freight and the North Pole

Los Angeles—The short cut—business producing—value of the trans-polar route from California to Europe is being strikingly demonstrated by the Scandinavian Airlines System. Its air freight service is burgeoning with orders after registering a 500% increase in shippers and a 430% increase in poundage since its inauguration.

Given scant attention by West Coast dealers and distributors at the time of its inception last November, the service has grown enough in recent months for SAS to open a new air freight office at Los Angeles International Airport. Additional service is scheduled to start during the winter months, according to SAS District Manager Peter Tornqvist. The airline now has three flights weekly in each direction. Each flight guarantees space for 2,200-lbs. of cargo on the DC-6B.

The main factor responsible for the growing popularity of this route is the fast direct service—flying time, 22 hours; elapsed time, 24 hours; distance, 5,800-mi. This avoids the bottleneck in New York where shipments are transferred from plane to storage and often lay over a day or two awaiting space on a European flight. Lower air packaging and crating costs and lower insurance rates also contribute.

Cargo shipments to Europe have been heaviest in aircraft parts, machinery and machine tools, Hollywood films and electronic equipment. Douglas Aircraft Co. ships emergency parts and equipment to world-wide servicing points. There also have been live seals, minks, fresh cut flowers, frozen turkeys and perfumes.

SAS is developing contacts for imports and exports. They were the initial contact in setting up a distributor in Sweden for a Southern California bathing suit manufacturer.

Air France Revenues at New High But Rising Costs Keep It in Red

Paris—Gross operating revenues of Air France in 1954 totaled more than $132 million—an increase of 17.4% over 1953 and a new high for the company—while operating and capital costs rose by 16.1 per cent, according to the company's annual report which has just been made public.

As expected the company showed a deficit for the year of 3,385 million francs (just under $9,700,000). The loss figure is officially reduced, however, by an $8 million subsidy payment by the French government.

Traffic increased on all sectors of the Air France operation. North Atlantic traffic was up by 50% over 1953, based on ton/kilometers. The number of passengers on North Atlantic runs reached 40,209. While this record leaves Air France in sixth place among trans-Atlantic carriers, it represents an increase of 14 percent over the previous year as compared with an 8% rise for all companies operating North Atlantic services.

Air France's labor force reached 15,915 on the first of January, 1955, representing an increase of 3.4% for the year. Ton/kilometers per employe rose by 14.9% during the year, reaching 16,535. Wages were steady and accounted for nearly forty percent of total outlays.

Apart from an addition of six Vickers Viscounts and four Breguet 763 "Deux Ponts," Air France's fleet remained substantially unchanged. In 1955, however, delivery of eight Super-Constellation 1049Gs and another Breguet will substantially alter both the capacity and the competitive position of the line. Two additional 1049Gs are expected in 1956 and twelve 1649As will be delivered by Lockheed during 1957 and 1958. Of interest to French plane builders is the failure of the 1954 report to mention plans for acquiring the HD-32, Hurel-Dubois' high-wing replacement for the DC-3 which will be available in 1956 and 1957. Earlier reports had indicated the line's willingness to take up to 24 of the new planes which are planned for series production by Societe Nationale des Constructions Aeronautiques du Sud-Ouest (Sncaso) up to a total of 150 units. Air France was still operating 38 DC-3s at the end of the year.

The annual report reflects considerable accounting gymnastics to keep the line's deficit below the 3.5 billion-franc figure forecast earlier in the year. The amortization base for new equipment has been shifted from five years to six (applicable to all unamortized equipment except the Breguets which will continue to have a five-year write-off period).

Even so, this depreciation remained a major factor in 1954 costs, totaling 4.9 billion francs ($14 million). Interest charges reached 1,4 billion francs ($4 million).

The report stresses the fact that current negotiations with the French government, particularly with respect to financial liability for so-called "prestige routes," may substantially lessen the reported deficit. No indication is given as to when these negotiations may be completed.

Air France's international routes and its European network were the big money losers during 1954, each operating at a deficit of approximately two billion francs ($5,700,000). Operations within France and the French Union were profitable to the extent of 1,250 million francs ($3,570,000).

CAB ORDERS

(Aug. 4-10)

GRANTED:

Japan Air Lines application to perform three round-trip flights between Tokyo and Sao Paulo, Brazil, via San Francisco, providing only through passengers between Tokyo and South America are carried.

Piedmont Airlines permission to serve Charlottesville, Va., through Albermarle Airport and Washington, D. C., through Washington National Airport.

Leave to intervene in the foreign air carrier charter service case to American Airlines, Delta-C&S Airlines, Northwest Airlines, Pan American World Airways, Trans World Airlines, United Air Lines, Aircoach Transport Assn. and the Independent Military Air Transport Assn.

Hawaiian Airlines an exemption to provide free transportation to local travel agents between Hawaiian points not in excess of two trips annually for each travel agent.

Trans-Pacific Airlines an exemption to provide free transportation to local travel agents between Trans-Pacific points not in excess of two trips annually for each travel agent.

Braniff Airways an exemption to use Miami as an intermediate point on its Houston-Havana route on those days when the Eastern-Braniff interchange between New York and South America is not being operated for one year or until daily interchange service between New York and South America is provided.

Ozark Air Lines permission to serve Dubuque, Iowa, through Dubuque Municipal Airport; Fort Dodge, Iowa, through Fort Dodge Municipal Airport; Mason City, Iowa, through Mason City Municipal Airport; Sioux City, Iowa, through Sioux City Municipal Airport, and Waterloo, Iowa, through Waterloo Municipal Airport.

APPROVED:

Agreements between Northwest Airlines, Delta Air Lines and various other carriers relating to inter-carrier arrangements.

Control relationships between Atlas Corporation, The BAB Company, Titeflex, Inc., and Northeast Airlines with certain provisions.

ORDERED:

CAB compliance counsel to produce certain documents relating to the Great Lakes enforcement case subject to motion for deletion on security grounds. The examiner's ruling relating to the various documents is vacated.

Pan American World Airways' Latin American Division temporary mail rate fixed at the rate proposed by the Board in its show cause order for the period starting Jan. 1, 1955.

Pan American World Airways' Pacific Division temporary mail rate fixed at the rate proposed by the Board in its show cause order for the period starting Apr. 1, 1955.

West Coast Airlines' temporary mail rate fixed at the rates proposed by the Board in its show cause order for the period starting Nov. 1, 1953.

Applications of National Airlines, Eastern Air Lines, Mackey Airlines and Pan American World Airways relating to New York-Nassau non-stop service consolidated and set down for hearing before an examiner.

Braniff Airways' temporary certificate for service to Ft. Dodge, Dubuque and Rockford terminated Aug. 9, 1955. Braniff's certificate for Route 106 is rescinded as of the same date and the carrier is issued an amended certificate for Route 26 authorizing service between Sioux City and Chicago via Waterloo.

North Central Airlines application for a Detroit-Buffalo route via Erie, Pa., included in the Erie-Detroit service case.

Certain language contained in a Mohawk Airlines document stricken from the record in the Erie-Detroit service case as "intemperate."

Investigation of air service between Panama City, Fla., and Atlanta and the need for certification of National Airlines, Eastern Air Lines or Southern Airways on the route.

DISMISSED:

Frontier Airlines' application for service to Phoenix, Ariz., at the request of the applicant.

DENIED:

Applications of City of Fort Smith, Ark., and the Fort Smith Chamber of Commerce, Central Airlines and Ozark Airlines for service between Fort Smith and St. Louis, Mo., via Fort Leonard Wood, Mo., and Fayetteville and Harrison, Ark.

Petitions of Trans Caribbean Airways and Overseas National Airways for reconsideration of the trans-Atlantic cargo case.

Air Express International Corp. request that regulatory policy for foreign indirect air carriers be included in the investigation of matters relating to indirect overseas and foreign air transportation of property.

Airline Traffic — June 1955

	Revenue Passengers	Revenue Passenger-Miles (000)	Revenue Passenger Load Factor	U. S. Mail Ton-Miles	Express Ton-Miles	Freight Ton-Miles	Total Revenue Ton-Miles	Per Cent Revenue to Available Ton-Miles
DOMESTIC TRUNK								
American Airlines	10,578	7,003	**65.38**	12,458	241	232,377	965,014	**66.25**
Braniff Airways	141,416	53,139	**62.84**	154,014	86,361	350,821	5,667,079	**56.49**
Capital Airlines	241,228	77,058	**63.75**	278,786	208,526	338,624	8,189,090	**47.15**
Colonial Airlines	41,120	10,340	**55.35**	13,216	6,933	26,410	1,008,562	**53.32**
Continental Airlines	..... *	20,255	**57.04**	62,814	25,261	123,325	2,149,987	**48.68**
Delta C & S Air Lines	176,884	78,499	**68.02**	258,450	200,286	564,952	8,547,397	**62.34**
Eastern Air Lines	547,955	261,711	**64.02**	800,029	419,460	1,172,365	28,863,388	**51.70**
National Airlines	89,762	60,396	**67.32**	218,911	40,094	302,710	6,698,540	**67.29**
Northeast Airlines	55,589	11,255	**59.42**	10,769	16,433	45,737	1,091,291	**57.43**
Northwest Airlines	127,216	87,755	**69.86**	413,508	213,806	542,211	9,769,664	**61.03**
Trans World Airlines	359,596	286,154	**73.77**	1,063,000	614,131	2,024,301	31,093,830	**65.82**
United Air Lines	518,141	366,819	**75.29**	1,965,691	3,712,280	368,743	41,871,391	**64.47**
Western Air Lines	95,378	46,963	**61.41**	20,130	72,633	242,337	5,004,369	**56.23**
LOCAL SERVICE								
Allegheny Airlines	37,771	6,041	**51.43**	6,770	16,447	.....	599,378	**51.41**
Bonanza Air Lines	8,082	1,864	**53.90**	3,275	1,862	3,175	186,559	**51.75**
Central Airlines	8,131	1,276	**28.90**	3,830	1,163	4,289	131,226	**26.01**
Frontier Airlines	16,230	4,237	**48.47**	14,465	7,524	62,606	489,432	**58.80**
Lake Central Airlines	10,396	1,602	**37.02**	2,250	9,265	.....	156,346	**33.57**
Mohawk Airlines	23,789	4,156	**61.91**	4,463	6,090	8,414	415,001	**61.82**
North Central Airlines	43,972	6,936	**55.12**	16,840	23,617	.....	703,975	**48.93**
Ozark Air Lines	23,804	3,623	**40.55**	6,845	12,852	.....	358,219	**40.67**
Piedmont Aviation	35,373	6,845	**58.94**	12,700	9,711	14,293	692,179	**58.48**
Southern Airways	15,239	2,591	**42.78**	8,809	9,600	.....	266,025	**40.53**
Southwest Airways	25,254	4,818	**58.91**	6,269	4,839	16,668	486,763	**58.45**
Trans Texas Airways	13,970	3,211	**41.62**	11,358	6,029	13,769	337,007	**38.22**
West Coast Airlines	18,950	3,253	**47.08**	3,999	2,157	10,111	309,920	**50.81**
INTERNATIONAL								
Braniff Airways	3,059	7,170	**50.95**	32,520	.....	81,288	924,218	**51.50**
Delta C & S Air Lines	4,320	5,062	**52.78**	7,083	.....	50,596	578,882	**43.30**
Eastern Air Lines	17,469	24,401	**75.09**	56,542	.....	65,791	2,703,179	**63.77**
Northwest Airlines	9,825	20,163	**62.73**	847,859	10,136	636,909	3,619,238	**68.34**
Pan American World Airways								
Alaska	8,741	10,422	**68.30**	34,762	.....	363,275	1,452,791	**51.85**
Atlantic	90,658	122,609	**72.71**	831,791	.....	1,489,426	14,954,685	**70.43**
Latin America	82,832	84,257	**68.54**	316,118	.....	2,544,039	10,948,503	**63.42**
Pacific	22,003	66,612	**75.03**	1,101,389	.....	1,027,264	9,056,866	**71.87**
Pan American-Grace Airways	10,714	12,328	**55.85**	39,938	203,256	54,052	1,572,377	**53.13**
Trans World Airlines	27,062	73,427	**74.49**	716,727	657,724	657,724	9,051,497	**72.50**
HAWAIIAN CARRIERS								
Hawaiian Airlines	36,533	4,934	**66.29**	3,563	.....	129,181	566,980	**57.63**
Trans Pacific Airlines	19,247	2,498	**61.24**	901	93	10,027	201,484	**58.38**
CARGO LINES								
Flying Tiger Line	1,457	2,010	**85.28**	.....	.....	3,743,841	3,944,858	**72.48**
Riddle Airlines	.....	.....	.....	.....	.....	864,691	864,691	**100.00**
Slick Airways	862	3,544	**92.68**	3,216	.....	4,217,384	4,575,033	**77.84**
HELICOPTER SERVICE								
N. Y. Airways	2,796	55	**59.78**	1,353	1,289	440	8,193	**57.06**
Los Angeles Airways	359	13	**18.57**	4,889	1,857	.....	7,955	**42.54**
Helicopter Air Service (Chicago)	.....	.....	.....	2,536	.....	.....	2,536	**42.6**

* Not Available

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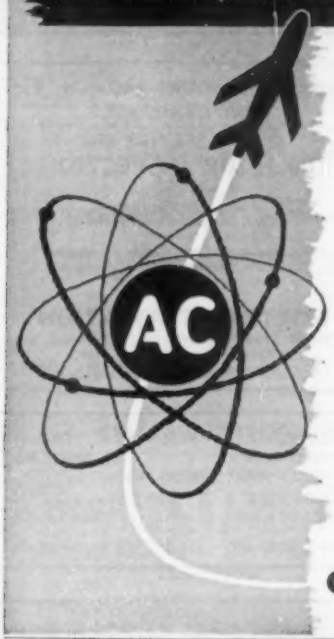

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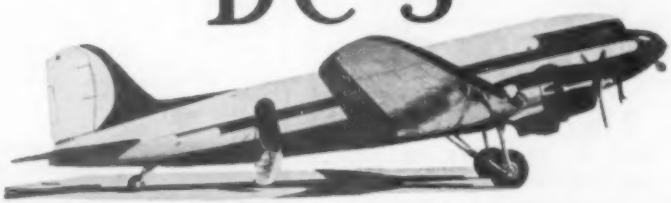

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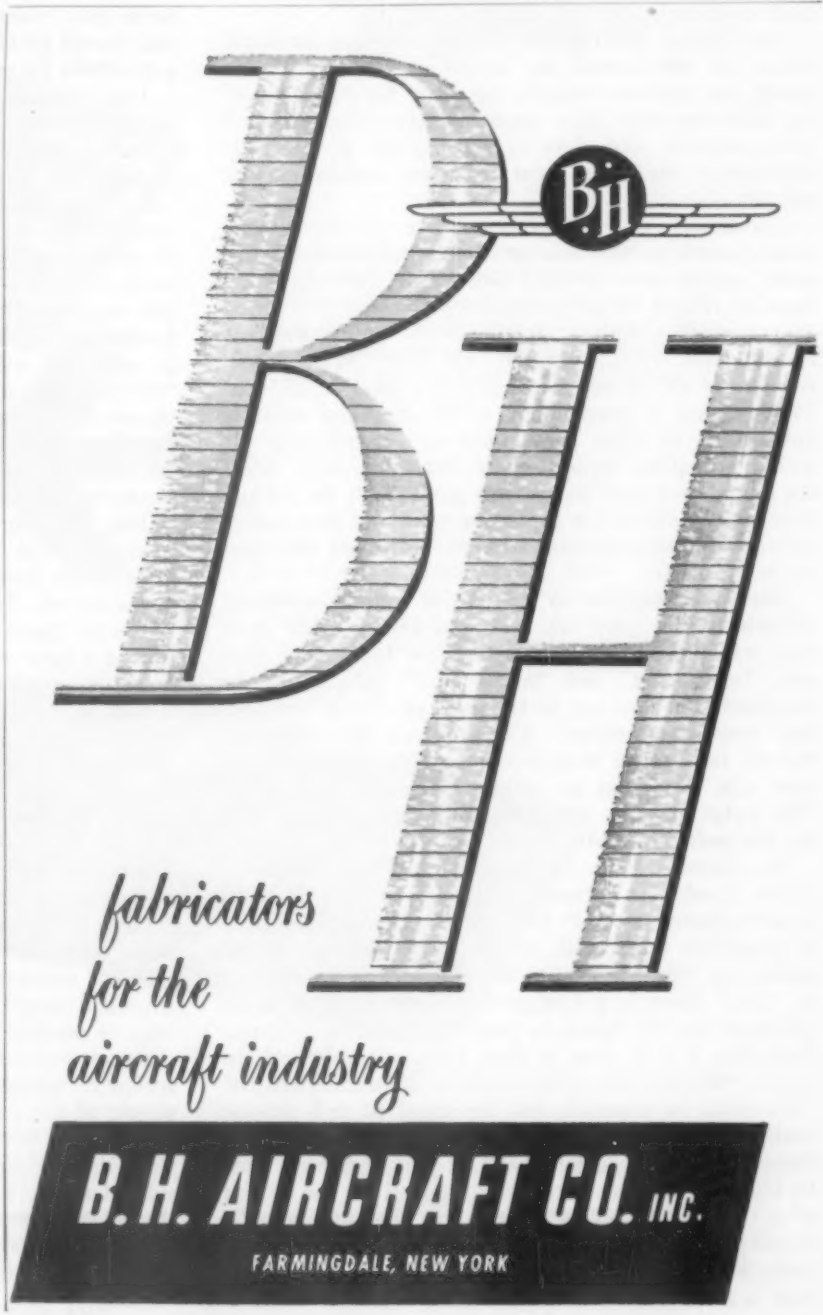

EDITORIAL

There Is No 'Gray' Security Area

Concern of American editors and scientists over the trend toward greater restrictions on the free flow of public information from government agencies spread to the recent convention of the Air Force Association in San Francisco. One of the speakers at the AFA meeting was Theodore F. Koop, director of Washington news and public affairs for the Columbia Broadcasting System. During World War II, Mr. Koop was associated with Byron Price in the Office of Censorship. Here are some excerpts from his address that are of interest to the aircraft industry:

The federal government has become the principal source of information we need—news about atomic energy, our military strength, our plans for civil defense, our relations with other countries, even the projected earth satellite. The duty of keeping the people fully informed is one of the most important confronting our officials.

Our heritage of a free press and free speech has been accompanied by the concept that government officials must operate in a goldfish bowl, that their every act must be subject to public scrutiny. Contrast this American viewpoint with a statement of the Communist revolutionary, Lenin, in 1920. He said: "Why should freedom of speech and freedom of the press be allowed? Why should a government which is doing what it believes to be right allow itself to be criticized? It would not allow opposition by lethal weapons. Ideas are much more fatal things than guns. Why should any man be allowed to buy a printing press and disseminate pernicious opinions calculated to embarrass the government?"

One misconception on the part of some government officials is that they can pick and choose what news they will release. The suggestion has been made that only "interesting" and "constructive" information be disclosed. But who is to be the judge of what is "interesting" and "constructive?" Certainly not the official involved, because he then would be able to pass on his own acts, to seal up his mistakes, to avoid controversy. The judge must be the public and the newsmen who are the public's agents.

No elaborate scorecard is needed to reach a decision. There is only one question which can properly be asked in determining whether to withhold information: Does it jeopardize the security of the United States? If the answer is "No," it should be released. If the answer is "Yes," there is a further consideration: Is it more necessary for the American people to have the information than it is to keep it from foreign circulation? In many instances this answer will be in the affirmative. This could be especially true in regard to civil defense matters. In the event of an air attack on the United States, the people would have an overpowering "need to know." Our very lives would depend on the receipt of a certain amount of information that undoubtedly would be of interest to the enemy. Yet in Washington today we hear reports that the Civil Defense Administration is not always given—even in confidence—information it needs for proper planning.

Another misconception is that there are some "gray areas" in the field of security information, poorly-defined areas where it is difficult to decide whether the security factor is paramount. These areas involve unclassified material—usually scientific data—which first the Commerce Department and more recently the Defense Department have been trying to bottle up. I fear they are trying to bottle a will-of-the-wisp. I cannot help but feel that security areas must be either black or white, never gray. Information is either of a security nature and should be classified, or it does not involve security and should be released.

That, it seems to me, is the heart of the whole information problem: The government must put its house in order. How can this be done? It is not a matter of writing new directives; President Eisenhower's Executive Order on classifying information in 1953 was a considerable step forward. Rather, it requires a change of attitude on the part of many individual officials. So far they have taken the easy way: When in doubt, classify and suppress. One of the best things that could happen would be for the Budget Bureau to forbid the purchase of any more rubber stamps marked "Confidential" or "Secret." Any man with those stamps on his desk has an overwhelming urge to use them. I suspect that when President Eisenhower abolished the classification of "Restricted," most of the "Restricted" documents were promptly labeled "Confidential."

The problem, then, is getting an official into the frame of mind where he does not ask himself, "How little of this information do I have to give out? Instead he should ask, "How much of this can I possibly release?"

We are discussing this subject of security of information at a time when President Eisenhower has made a dramatic proposal: that the United States and Soviet Russia exchange aerial inspection of their military establishments. How this suggestion must have surprised some of the men who play with the rubber stamps I mentioned! It must have turned topsy-turvy their fondest notions about security. Even if the President's bid should come to naught, it still could serve a great purpose by putting into a new perspective the question of how many secrets we really need.

Now, following this bold offer, comes the atoms-for-peace conference and its removal of much of the secrecy that has surrounded non-military atomic work. As the Atomic Energy Commission said, "The collective knowledge of mankind on how to put the atom to work for material progress in all lines will be shared among the technical representatives of the great majority of the people of the world."

These are heartening events. When our leaders take steps to share information of this magnitude once considered secret, they are doing far more than adding to the enlightenment of American citizens. When they recognize that knowledge knows no national boundaries, they are strengthening the bulwarks of civilization everywhere.

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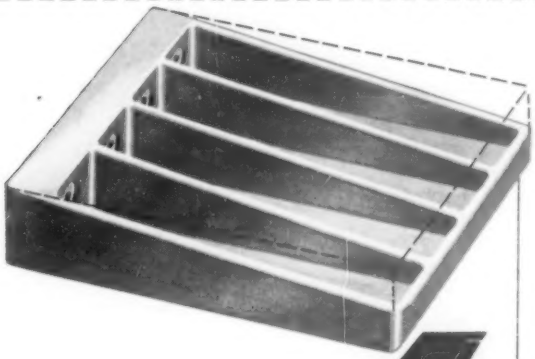

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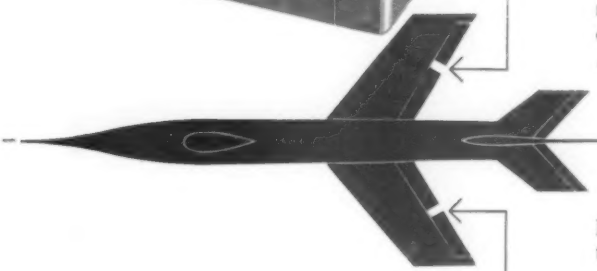

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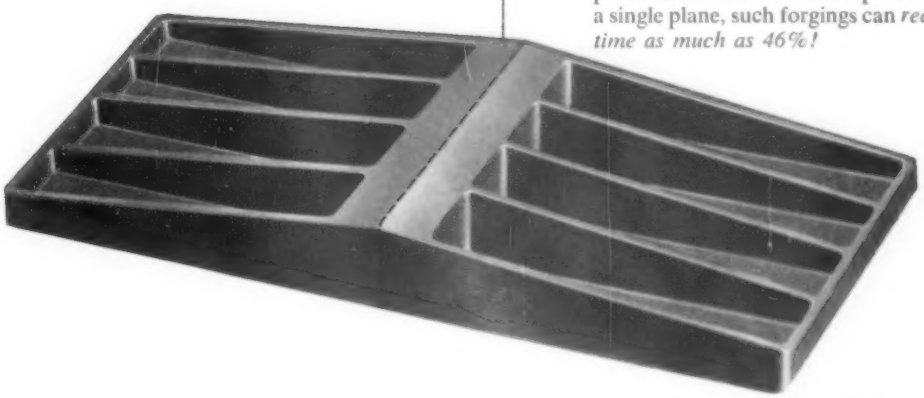

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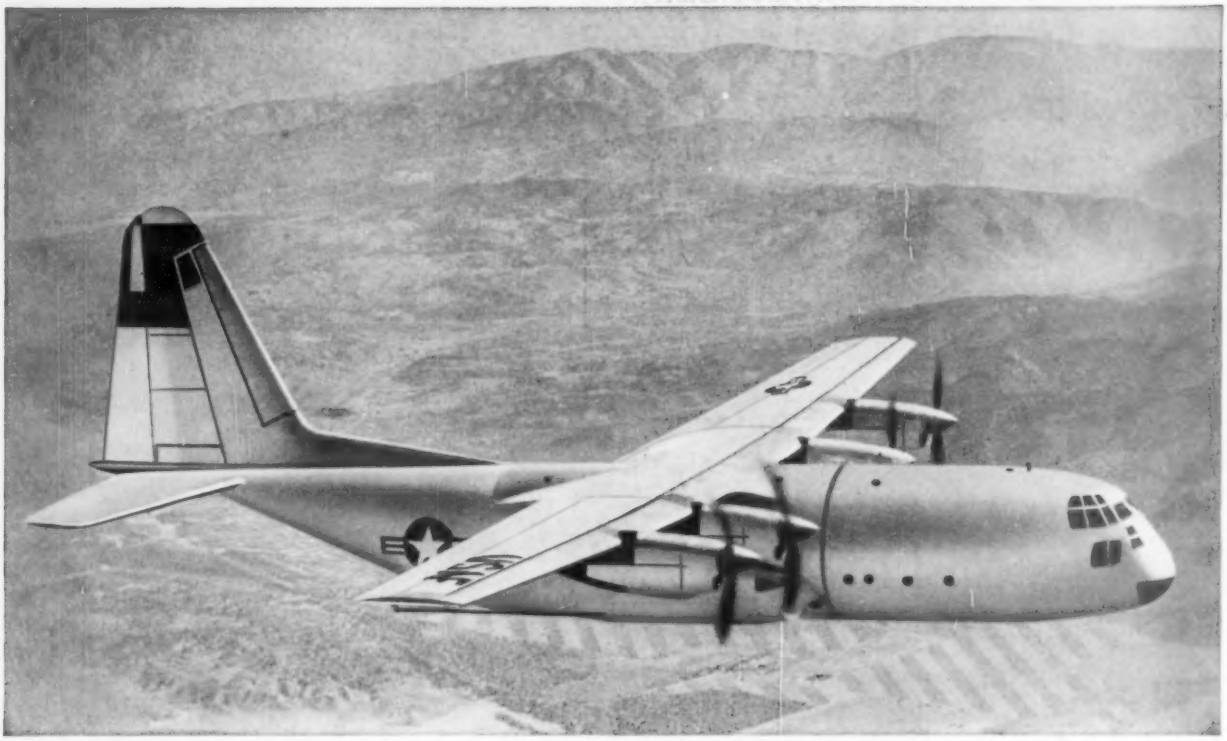

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A NEW era in America's military transport operations was opened when the U.S. Air Force's first production Turbo-Prop cargo transport, the Lockheed C-130A Hercules, took off from Dobbins Air Force Base, Georgia.

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